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AVIATION AND COSMONAUTICS

No 5, May 1989

Air Force Official Discusses Meaning of Military Aviator's Profession

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[Article by Honored Military Pilot USSR Col Gen Avn A. Borsuk, Air Force deputy commander in chief for combat training: "A Certain Profession"]

[Text] It was May 1945.... History had rendered a verdict against fascism. Reaching this point had required 1,418 days and nights of savage struggle and a superhuman effort by the entire Soviet people, particularly our homeland's fighting men.

Approximately 4 million combat sorties. More than 30 million bombs. 48,000 victorious combat engagements in the skies. This is the contribution the Soviet Air Force made to the overall struggle against fascism.

The following figures apply to decorations awarded to Air Force personnel during the Great Patriotic War: 2420 were named Hero of the Soviet Union; 65 were twice awarded this honor; A. I. Pokryshkin and I. N. Kozhedub were named Hero of the Soviet Union three times. More than 197,000 military aviators were awarded medals and decorations.

Peace came to the Soviet people. Things were not easy, and it was not a cloudless peace, but it was peace nevertheless. But how about the Armed Forces? And the Air Force? Has the period 1945-1989 involved only combat training? No, it has not. Military aviators have time and again helped brother peoples in their struggle for hard-won social ideals. At the end of the 1940's and beginning of the 1950's it was Korea. In 1962 it was Cuba. From 1965 to 1975 it was Vietnam. In 1970-1972 it was Egypt, and then there was Afghanistan.... Help was rendered to differing degree and in various forms. But combat skill and experience in employment of air forces were always required. And frequently heroism and self-sacrifice were also necessary.

Fighting man. Air warrior. Defender of the homeland. Constant readiness for combat. Both professional and moral. It is not easy to state which is more difficult. And not only high-ranking command personnel answer this question, but also each and every military airman. They answer it with their military service, and they answer it with their own conscience.

Life in the military, for entirely understandable reasons, cannot be totally open to general scrutiny and study. To outsiders this gives rise to an illusion of unusual simplicity of the entire structural edifice of Armed Forces life and activities. And everybody judges the affairs and problems of the Armed Forces: from comedy film director to academician specializing in foreign countries, from novice writer to enterprising journalist. Several days among military personnel, or even just a 30-minute conversation. A single interview. And everything is clear and understandable: how combat readiness can be increased, and how negative phenomena in the state of military discipline can be overcome. Everything is obvious to the casual observer; everything is easily resolved or surmounted. An entire program of reforms is ready to implement. And no intensive effort is required to find a solution to difficult conflictive situations. No serious analysis or profoundly thought-through, carefully carried-out experiment is needed.

Confidence that one will gain an exhaustive understanding of everything involving the Armed Forces is born from the constitutional duty, readiness and willingness of the citizen-patriot to defend the homeland.

But today's soldier is a professional. And our Air Force professionalism is one of the most complex types mankind has ever mastered and is eternally in the process of mastering. Of course one can see from the ground that "the airplane is in the air." But those whose thoughts, nerves, and muscles are part and parcel of the Air Force system are clearly aware of the fact that "airplanes do not fly themselves"....

But let us leave the privilege of artlessly and easily solving all acute problems in all branches and sectors to those who bear no responsiblity whatsoever for their resolution, their implementation, nor for the consequences. We are professionals, and our concerns are concrete and specific.

But even the concrete and specific is multifaceted, many-sided, and conflictive. For this reason we shall limit the scope of our discussion to just one area. How is the combat skill of today's Air Force man formed, shaped, and perfected?

The regiment had returned to its base following an exercise. The aircraft were standing on the flight line, and personnel were hurrying homeward, to a deserved rest. The tactical air exercise after-action debrief had been completed. Papers had been filled out. Preparations for scheduled flight operations had commenced. For the first few days following the exercise one can still hear fond recollections: "Do you remember...." But within a week the flood of routine tasks effaces the memory of recent events.

But for some of the men this exercise had been their very first. Some of them experienced very painful moments, when it seemed that the mission would not be accomplished. And now the strength and weaknesses of those decisions which were made in a "combat situation" were quite apparent.

There were also problems which have remained unresolved. On one sortie they barely got things together, while some things proved to be simpler than anticipated. And there were many other incidents, questions, and

doubts. Many of them were never brought to the attention of command personnel, and therefore were omitted from the overall performance record and from the after-action debrief materials. And the post-exercise critique and analysis, even though it provided a full answer to the question of what had been accomplished, failed to answer the main question: what has the regiment, squadron, flight, two-ship element, pilot, and aircraft technician [crew chief] learned? After all, this was a tactical exercise, not merely a performance-testing event but a tactical exercise. A high-level, combined form of combat training.

Did the exercise help raise the level of professionalism? After all, a great deal was accomplished. Dozens of complex mission assignments and scenario instructions presented both in the air and on the ground. But a strong finale was lacking: a genuinely instructive, deeply-inquiring analysis. Professionalism has suffered.

...A detailed tactical exercise plan and schedule had been drawn up. Participating personnel had been briefed on the probable missions they would be assigned. Leaders had been briefed in incomparably greater detail. For them the scheduled exercise was already embodied in specific details: streams of targets, "enemy" countermeasures, tactical problems, etc.

The exercise began. Does one often succeed in following the plan and schedule precisely? Virtually always something interferes in the calculated, intended rhythm. The weather, for example. Because of this it was impossible to execute the original tactical variation. Due to that same timetable which had been allocated for the exercise.

What would the exercise director do? Experience indicates that response varies. Some officers will do everything they can to ensure that the level of complexity of the test of combat proficiency does not diminish. But there is also another "strategy." Pronounced simplification. A two-ship element is sent into an air-to-air engagement in place of a squadron. A strike on ground targets, instead of attacking the target from different directions and employing complex types of maneuver—degenerates into slow-paced, dragged-out, primitive-tactics standardized-pattern attacks. The "enemy" offers no opposition. Everything is simplified to the maximum. There is no longer actually a combat environment; it is merely specified in the lip-service manner.

Two approaches.... And what different results in improving professionalism! With the first approach there is an unquestioned "plus" added to past know-how. The second approach produces zero.

...Two fighter elements are engaged in air-to-air combat. They execute the most complex maneuver sequences. They were performing at maximum capabilities of aircraft and pilots. It was difficult even to follow all the unexpected complications. This was real combat. Suddenly a finger of doubt crept in: "Why is it that everything is working out so nicely in such a difficult mock battle?" This was true. The "combatants" were alternating roles. A moment ago a flight was boldly attacking, but now it was in a defensive posture. And a maneuver would end with a marksmanlike placement of fire. What a fantastically high level of professionalism these pilots display! How exceptionally expert at tactical control are the officers at the command post! Or....

Or does serious tactical deficiency lie concealed behind the external complexity of the combat engagement? Are we dealing with a prior agreed-upon plan for the entire combat engagement and for all combat-maneuver elements?

We have a paradoxical situation here. A flight which is highly complex in execution gives the participants practically nothing in a professional respect, because this combat engagement is built upon a faulty foundation. We have total certainty in place of an air encounter with all the difficulties caused by situation uncertainty (arriving at a decision when so little is precisely known about the "adversary"). This is how we shall close, this is how the pre-engagement phase will run, this is how we shall proceed, and that is how the "adversary" will respond. And so on....

In fact, a strange encounter. It is hard on the pilots, and it is hard on the tactical control officers. And yet it provides no increase in professionalism, because this combat engagement model is fundamentally flawed. It fails to reproduce the principal component of genuine combat—the manifestation of random factors, which comprise not the sole reality but perhaps the most important reality of genuine combat confrontation.

What is surprising is that it is somehow unfair to call such a mock combat engagement unnecessary situation simplification, for it is in fact very difficult for all participants involved. It is difficult indeed, but the problem is that there was no combat engagement, and this means that professionalism was not put to the test, was not raised to a higher level.

...Ground "combat" is in progress. Helicopters are providing close air support to motorized riflemen. The squadron positioned its helicopters in such a manner that the "enemy" was kept literally pinned to the ground. Following a nice, effective performance, the helicopters return to the field to ready for the next sortie. The "enemy" launches a counterattack precisely at this moment. "Enemy" tanks dash across a water obstacle and immediately "engage." The motorized riflemen are frantically trying to fight off the counterattack. A couple of helicopters would come in handy at this point! But there are none. The squadron had come out in full strength. And it had also left the battlefield in full strength. Coordination was interrupted only for a few minutes, but the motorized riflemen lost the "battle."

Once again we have a familiar picture. The slightest degree of unnecessary tactical simplification and the most masterful strikes will fail to produce the required

combat result and will not help improve the professionalism of the Air Force commander, subunit, or combat pilot.

Of course the practical results of tactical air exercises are gratifying for the most part. The principle of "teach troops that which is needed in war" is being carried out in the majority of units and subunits. But military people should never have a feeling of complacency: the social responsibility resting on the shoulders of the Armed Forces is too great for that. It is for this reason that a detailed critical analysis of any mock combat situation which arouses doubts about whether an exercise, training flight, or training drill was genuinely instructive or raised the level of professional skill is warranted and justified. And was the analysis itself thorough? What experience was obtained for subsequent utilization, what deficiencies were revealed for immediate correction, and what adjustments have been made in the combat training process?

I should emphasize that we are discussing only one facet—the tactical aspect—of flight activities. Of course there are others as well. These include flawless mastery of flying technique, psychological-ergonomic competence, and technical knowledgeability. But flight personnel technical knowledgeability is a separate area and is by no means a simple phenomenon. In short, the professionalism of the military aviator is multidimensional. Each and every coordinate is complex in and of itself. And the aggregate of all elements represents a complexity of a very high order of magnitude.

Nevertheless the culmination of a combat pilot's professionalism is his tactical skill, that is, his ability to fight and ability to carry out combat missions. It is precisely this aggregate of skills which serves to further implementation of the social function both of the Armed Forces and of each individual member of the military. This is also the reason for our concerns primarily with this aspect of training.

The cited examples illustrate two important facts. The first is that any instance of excessive simplification within the tactical training system narrows, impoverishes, and negates genuine professionalism. Secondly, combat skill is formed and shaped not by some one specific kind of training but by that daily environment and the conditions which are provided to the military aviator in which to train, act, work, serve, and live.

For this reason those officers who are responsible for the comprehensiveness and reliability of training subordinate flight personnel have a particular debt both to the homeland and to flight personnel. This duty is to create a genuinely functioning school of professionalism, and the leading subject in this school's curriculum is tactics and tactical skills.

It is not proper procedure to impose specific mission configurations. An endeavor to handle all details and make all decisions for one's subordinates is not helpful or beneficial. Excessively close supervision at all times and holding a close rein on every step and decision are unwarranted. This leadership style frees subordinates not only of duties but also infringes on their right of independence. It virtually disarms lower-echelon commanders, depriving them of continuous training in performing the entire aggregate of job-related functions.

There is a "secret" to this method of command and control, for it is very difficult to create an entire system of conditions which form and shape genuine combat performance characteristics. In addition, such a system is not created to remain permanently rigid as it stands. We are dealing here with a continuously dynamic nature. Performance should not be graded forever on the basis of a single established scheme. Exercises should not be conducted according to a single tested and proven pattern. The same combat environment and situation models should not constantly be repeated. The same old "surprise" scenarios should not continue on year after year.

Creation of favorable conditions promoting the growth of professionalism is a continuous process. It is an intensive, creative, critical process. And, incidentally, it is a process which reveals the level of understanding of military aviation affairs attained by the leader-officer.

How can one avoid hiding behind concern with specific "trifling matters," particularly since, as the well-known aphorism states: "There are no trifling matters in aviation." It would seem to be correct and even noble to deal with particular items in combat training. How can one avoid taking cover behind the screen of the endless daily routine of one's duties which, if stripped of the negative surface coating, remains a real fact, not a fiction or invention. The high-ranking officer, possessing greater authority, overcomes the flood of trifling matters without effort, displaying an example of how to handle the job.

But such a genuinely major problem as a well-planned and effective combat training system, which extremely accurately and fully simulates the realities of today's combat, is artificially simplified and reduced to something crudely primitive. And professionalism goes by the board.

Just what is the professionalism of the military pilot? I lay no claim to uttering the final word of truth. I shall simply express my opinion.

The professionalism of the military pilot is a potential ability, formed and shaped by the entire combat training system, effectively to carry out missions in an actual combat environment, making use of all the aircraft's combat capabilities. It is a continuing ability, which does not require any special measures to accomplish its practical implementation. That is, it is the ability to combat-engage instantly, without additional training classes, drills, formal instructions, explanations, practice, training flights, exercises, etc. Of course this thesis does not state the entire aggregate of elements comprising this

ability. I have stated only the main component of professionalism: specific role and mission.

I am convinced that precisely this approach most accurately guides, adjusts, and summarizes everything that comprises the life of military personnel and military units. Because without correlating all particular elements of prowess inherent in an individual, group, or unit with the ultimate role and function, one is saying nothing about the true functional value of these communities. Professionalism is that centripetal tendency (force) which binds, corrects and adjusts, unites and harmonizes the component elements of the activities of a representative of any occuaptional specialty, including the military aviator.

It is a fact that the individual components comprising the occupational specialty of military aviator, as they become professionalism, are not simply added together but coalesce into a new, integral quality which exceeds the mere sum of the individual components. For example, the very highest degree of skill in aircraft handling and performance, if not crowned by tactical competence, is virtually useless and senseless for the military pilot. The most flawless tactical inventiveness is useless if it is not supported by corresponding aircraft handling proficiency. The most outstanding knowledge of an aircraft's construction and operation is almost worthless if that aircraft can be destroyed by extreme conditions which the pilot's conditioned mental and emotional makeup is unable to counter. And only a fusion of these (and many other!) components takes on something totally new and becomes combat proficiency.

The components of an occupational specialty are centrifugal in a certain sense. They require knowledge and skills of a various nature. Professionalism with its synthesizing directional thrust is essential here as well. It is for this reason that we turn to tactical exercises—not to training classes, training drills, or even scheduled training flights. All such forms create, improve, and assess only particular aspects of combat proficiency. They may be very important aspects, but nevertheless they are merely components of the whole. Exercises, however, are focused on professionalism. This is just as synthetic a form of combat training as professionalism itself.

It is the culmination of a quite definite, content-specific phase of training. It can become a test of professionalism if it is preceded by an entire school of proficiency enhancement. What is needed to get such a school to function? First and foremost genuine goal-oriented planning and scheduling, which begins with an objective appraisal of the initial level of professional competence and proficiency of the pilot, two-ship element, flight, and squadron. There should be standardization here or adjustment to some single standard, although such a procedure is very convenient and does not require multiple-variation specific appraisals.

Let us say that all combat pilots in the squadron are 1st class. Does this mean that both the initial level is identical and that possible future achievements are equal? How simplified the planning and scheduling process becomes! What savings in commander labor and time! Plus a guarantee of relative calm. Particularly since the logic of such planning will dictate one more simplification—focus on the least proficient pilot in the subunit. The rest of the pilots will have a good, solid safety margin of skills in performing training assignments of normal complexity.

And everybody proceeded according to a single plan. Everybody arrived at the same performance result in some specific training category. Everybody is prepared for the same tests. Everybody takes part in single-variation missions in a standard tactical exercise. But the fact is that pilots 1st class are not all equal. Some have just recently earned this rating, while others earned it years ago. Some are talented, while others are solid "average achievers." Some are inventive, while some are simply "by the book" executants.

Therefore the initial level is not the same for all. But everybody needs to improve. Therefore the end objective cannot be identical for everybody. One and the same goal requires quite different efforts from different pilots. And different efforts will produce different increases in professionalism. Some will spend the entire time assimilating new things, while some will be repeating old skills. Some will be working at maximum effort, while others will be putting out a half-effort. And some will not strain themselves at all. And only a few pilots will rise to the next higher level of combat proficiency: but how should things actually be?

Without details, which each pilot can easily fill out himself, we shall note that both multiple-aircraft air-to-air combat and an air-to-ground strike consist of different (in level of complexty) fragmentary components. And within the framework of a single mission, all participants can be given personal mission assignments which will require full output of amassed professional capability. And it is very important that a tactical exercise contain situations which are differentiated in level of complexity, requiring a differing level of professional capability. But the first step toward such an exercise must be taken at the time of planning and scheduling combat training for the forthcoming year or period. Having begun with a question: who is who today in a professional respect?..., we shall continue with a question: who can and should become what as a result of training classes, practice drills, and training flights after a specified period of time, by the day of a tactical air exercise?

Of course the problems of professionalism are too numerous even to name or list. But we must feel the pulse of these problems and give thought to what can make the rhythm more precise and provide fuller content. This is what the discussion is about. We hope that it will continue in the thoughts, debates, and decisions of military aviators, of commanders and subordinates, those who lay down the foundation of an answer to the

question: do flight operations lead to professionalism or to a report of plan fulfillment? And those who ask themselves every day: have I added anything professionally to that which existed last year, last month, or yesterday?

Branches, agencies, establishments, and institutions essential for the normal functioning of society are created. Life consists of thousands and thousands of particular tasks and problems. Each problem requires competent solution, and each task requires competent execution.

The people's innumerable concerns include defense of the homeland. It is a common concern for citizens of the homeland. And for us military men it is the main, sole concern in one's life. It is our social function, which demands that it be treated as an important duty. And it requires reliable professionalism. For military men defending the homeland means first and foremost being an expert. In one's way of thinking and in one's daily life, in the ability to control oneself at the most critical moment, in the ability to carry out one's difficult job. In one's profession. Such a profession exists at the present time.

Promoting Perestroyka Through Political Instruction Activities

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[Article, published under the heading "Implementing the Decisions of the 27th CPSU Congress," by Col A. Tsepaykin, Air Force Political Directorate senior instructor: "Knowledge Should Be Working Toward Perestroyka: Problems of Party Guidance of Political and Economics Education in Air Force Units"]

[Text] The 27th CPSU Congress pledged party committees, party organizations, and ideological establishments to restructure the system of political and economics instruction. Its main goal is to equip Communists and party-unaffiliated with the ability to think and act in a politically mature manner and to promote dissemination of progressive forms of organization of labor and production.

Appreciable changes for the better have taken place in political instruction and indoctrination in the Air Force in the time which has passed since this party forum. Specifically addressing guidance of training and instruction of Air Force personnel, we should mention first and foremost a change in attitude on the part of the majority of commanders, political agencies, and party organizations toward political and economics education. It has unquestionably become more critically important and serious.

In carrying out restructuring of this type of instruction, political agencies and party organizations are focusing party and ideological activists on comprehensive resolution of the problems of radically improving its content, raising its ideological-theoretical level, and achieving practical return on effort. We should note that already today the innovative potential of all forms of instruction is skilfully being used in many military collectives and workforces of units, military educational institutions, Air Force enterprises and establishments to mobilize enrolled personnel to accomplish in a quality manner the priority tasks of this year and the present stage of development of military aviation.

The activeness of persons enrolled in universities of Marxism-Leninism, party activist schools, and other forms of training is growing under conditions of democratization and glasnost of military and party affairs. An atmosphere of productive debate and free exchange of opinion is fostering not only productive learning efforts, but is also making them into active participants in the search for ways to achieve further improvement in political and economics education as well as application of one's knowledge in job-related activities. One can judge this in the example of increasing the job-related and political activeness of personnel enrolled in universities of Marxism-Leninism and party activist schools headed by Majs V. Karpov, D. Osadchuk, and L. Shvets, Capt V. Zelentsov, and the party instruction and economics education groups led by Cols S. Matveyev and N. Rallev and Lt Col N. Meleshkin.

Nevertheless, in spite of obvious positive changes and trends, leader-Communists and ideological workers are concerned by the question of what can and must be done to make political and economics instruction become an inner need for each and every airman, and what can be done to ensure that its level of organization, content, and methodology are in keeping with the spirit of the time and the needs of the enrolled personnel.

Synthesizing accumulated observations and impressions in the course of studying in military units this and other problems of restructuring party-political work, we should like to analyze the reasons for existing deficiencies in party guidance of political and economics education and specify ways to eliminate them.

Until recently it was considered practically a fixed rule, and the view still can be encountered on the part of some political agencies and party committees, that political and economics instruction is the concern exclusively of staff propagandists. An opinion developed over the course of years on the part of many commanders and aviation services supervisors, not without the "help" of political workers and party activists taking a compromiser position, that political and party instruction was a secondary matter. The attitude was that my area of activity is flight training (or aircraft) flight safety, and discipline. I have a staff propaganda officer; he is answerable for political instruction....

A passive role in Air Force personnel political and economics education played by leader-Communists, who are highly experienced in a professional and life-experience respect, is one of the reasons for the weakening of party guidance of this form of training and indoctrination of Air Force personnel and civilian employees at Air Force enterprises and establishments. Nor is it difficult to trace the chain of cause-and-effect linkages, at the end of which we come to the human factor. The fact is that level of leadership in large measure determines the effectiveness of training and consequently depth of knowledge and firmness of convictions on the part of enrolled personnel, and completeness of embodiment of convictions in practical affairs.

Unfortunately this interlinkage is forgotten in the busy course of daily affairs. And it is usually recalled when an accident in the air or on the ground occurs in the unit. Commanders, political workers, and their superiors proceed to analyze the causes of the incident. It frequently is ascertained that the incident occurred not only because somebody had undertorqued or overtorqued a nut, figuratively speaking. The roots lie deeper—in people's level of consciousness and knowledgeability, and in leader-Communists' attitude toward indoctrination work and its forms.

Our party arose as a political organization. It has always seen the significance of its activities in unification and political education of the worker class and in instilling socialist ideas and political self-awareness into the proletarian masses. This is a core tenet of CPSU program documents. Most of the points of the Party Rules, which specify the duties and obligations of CPSU members, contain the demand that party members aggressively conduct education effort through dissemination and explanation of party policy and active participation in its implementation, and that they display a personal example in their work and conduct.

I am far from suggesting that a regimental commander or officer in charge of an aviation service should drop everything and engage exclusively in organizing political and economics instruction. What I am saying is that there should be reasonable, but mandatory planning and scheduling of oral presentations by leader-Communists at instruction classes, their participation in seminars, tests and examinations, and the quality of the instructional process should be influenced by political workers and party organization activists.

It has long since been noted that the more interest a commander takes in the political training of his men and the more frequently he speaks to Air Force personnel, the more enthusiastically people attend instruction classes, and the greater the practical return on acquired knowledge. One should always bear this in mind.

Political and economics instruction in all its forms is a party concern. Those party committees and party buros which, not in word but rather in deed and in all seriousness, work with political and economics education of party members and all personnel are doing the right thing.

We could mention as an example the activities of the party committee in which Lt Col Ye. Bobrov serves as secretary. At every meeting the deputy secretary for ideological work—and this has become a regular practice—gives a detailed briefing on progress in political and economics instruction, on noted deficiencies, on steps being taken to correct them, and on participation by leader-Communists in organization and conduct of instruction classes.

Frequently such a briefing results in a detailed discussion, for the other party committee members, each in his own shop and section, are also current on the status of instruction of Communists in their shops. There are diversified forms of activist participation: attending classes, one-on-one talks with enrolled personnel, assistance to lagging performers, enlistment of the best-prepared officers and Soviet Army civilian personnel into agitation-propagandist activities, etc.

Is the influence of the party committee and party organizations felt on the quality of political and economics education and, through the enrolled students, on the success of the aircraft maintenance depot workforce? Of course it is. The plant was one of the first in the Air Force to shift over to the new conditions of economic management and labor remuneration. The workforce ended last year with solid increases in all plan-economic indices, and now, as it adopts full economic accountability, it is increasing the pace of production and improving product quality.

In this and in other cases the increased influence of the party committee and party organizations on quality of the training process and indoctrination of personnel is due to an endeavor by party members to introduce something new, something of their very own, to party work and to depart from stereotypes of formalistic-bureaucratic direction of the system of political and economics education, which have been unpleasant for everybody.

A detailed discussion of ways to overcome "paper-shuffling" work methods is currently in progress in Air Force political agencies and party organizations. Its purpose is to find a common policy in the campaign against a lip-service approach in training and indoctrinating personnel and to come up with constructive solutions. I believe it would not be a bad idea if this magazine's readers expressed their views, comments, and suggestions on this subject.

What is disturbing in the activities of certain party committees and party organizations pertaining to guiding the political and economics education of Air Force personnel?

First of all it is the continuing short-lived drive or campaign approach. As a rule, prior to the beginning of the new training year active work begins in Air Force units to form a party instruction system and to enlist student. But as soon as the groups are formed and classes have begun, activeness drops off. Once again everything quiets down. All concerns are dumped on the shoulders of the regimental propaganda officer and head of the university of Marxism-Leninism or party activist schools....

The tenacity of this drive or campaign approach apparently depends on the work style of the party agency and party organization. One can eliminate it primarily by means of well-defined and uniform distribution of duties among party members, by increasing the personal responsibility of each individual for the assigned work area, and by intensifying continuous oversight and accountability for personal contribution to improving the system of political and economics education.

Exceptionally conscientious individuals who are inclined toward pedagogic and agitation-propaganda work should unquestionably be the direct organizers of such instruction. It is important that their activities in this area be not of a temporary but rather permanent nature, extending over the course of several years. For this reason, in addition to indoctrinational and explanation work, it is necessary to make every effort to raise the prestige of our propagandists and to display concern for them. They should be exempted from all volunteer work assignments not connected with the duties of heads of schools, groups, seminars, etc, and it is necessary to resolve once and for all in favor of the body of ideological activists matters pertaining to making regular duty hours available to propagandists to prepare for classes, and their regular leaves should be scheduled taking the training process into account, with reward for achieved results in training and indoctrinating enrolled personnel.

Ideological activist training requires radical improvement. It is frequently conducted in a boring manner and without tangible benefit. Reports, instruction methods lectures, and addresses by leader personnel of various rank in the course of training conferences and seminars are with rare exception not carefully planned out and fail to enrich propagandists with new knowledge; they more likely on the contrary infect them with indifference and sluggishness.

In my opinion it is much more useful to speak frankly and in detail at such training conferences about deficiencies in organization of political and economics education, on ways to correct deficiencies, and to present for discussion specific proposals by the political section, party committee, and the training conference and seminar participants.

Where, if not here, for example, should one organize exchange of views and experience in working in the new manner? The well-known party Central Committee decree entitled "On Work by Party Agencies in Ulyanovsk Oblast to Implement the CPSU Central Committee Decree 'Restructuring the System of Worker Political and Economics Education'" discusses the urgent need to alter the countenance of the ideological worker and to teach him to work in conditions of extensive glasnost, increased democracy, and with people who are better informed. This is one of the paramount tasks today facing Air Force political agencies and party organizations.

At the same time, as practical realities in the military indicate, far from all propagandists are prepared to work in conditions of democratization and glasnost. Obviously things cannot continue this way. But how can we ensure that each and every ideological worker fully masters the art of conducting political discussion and debate, becoming, as it were, master of a rich methodological arsenal of party and agitation-propagandist activities? Correct answers must be found to all these and other questions, and as quickly as possible.

In discussing organizers of Air Force personnel political and economics instruction and their concerns, we cannot ignore the enrolled student, who is the object of the teaching and indoctrination efforts of propagandists.

Many Soviet Army officers, warrant officers, and civilian employees are of the opinion that their education is a personal matter. I attend classes if I want, and I skip them if I don't feel like attending. In my opinion such willfulness is a typical indication of a general tendency toward decreased demandingness on the part of Communists and party-unaffiliated toward themselves and their comrades, and a consequence of weak party demandingness.

Political agencies, party committees, and party buros have plenty of work to do here. They must seek effective ways to correct deficiencies. And I believe that they should begin with changing the system of student selection.

In my opinion the following should be the principal criteria for party recommendation for instruction: actual participation by or possible future utilization of a given Air Force Communist or party-unaffiliated in ideological and political indoctrination work; a need to raise the level of political consciousness and political knowledgeability primarily in such categories of leader personnel as aircraft commander, flight commander, squadron commander, chiefs of groups and aviation services. That is, we are talking about persons who by virtue of job duties and vocation will be able to and are obliged to pass on acquired knowledge and formed convictions to subordinates and colleagues.

Of course it is not possible to achieve a high qualitative makeup of faculties and instruction groups just one day or even a week before the beginning of classes. For this reason preparatory work should be continuous.

One more word about the prestige element of party education. It is difficult to raise the level of prestige if we continue to ignore officers' training and education when preparing efficiency reports, recommending for promotion, and commending personnel based on combat and political training performance.

I am convinced that, based on universities of Marxism-Leninism, it is necessary to concentrate principal efforts on training and refresher-training political and economics education system propagandists and propagandists dealing with Komsomol political education, if only because expanding the functions of these ideological establishments will attract more attention on the part of political agencies and party organizations toward them and will compel one to consider the qualitative makeup of instructors and improvement of instructional facilities.

Of course in this article we have touched upon only a few items connected with shortcomings of the political and economics education system presently operating in the units as well as with ways to restructure this system. There still remains a great deal which we must analyze in all aspects and put to a practical test, although perhaps the difficult and important task in principle is clear: utilizing democratic work methods, we must endeavor to unfetter people's initiative and innovativeness and create conditions for moving forward. Party organizations, which have a vital concern with effective influence by political and economics instruction on progress in perestroyka and on the success of military units and workforces, should without question be operating at the proper level of efficiency in this area.

Mastering Low-Level Flying and Flight Safety Analyzed

91441273c Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 6-7

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Military Pilot 1st Class Maj G. Zarva: "At Low Altitude"]

[Text] Military pilots frequently engage in debate on the subject of low-level flight. A good foundation for resolving such debates is provided by an article by Mar Avn A. Yefimov, Commander in Chief of the Air Force, entitled "The Right to Make a Mistake" (AVIATSIYA I KOSMONAVTIKA, No 12, 1988). It is in fact difficult to find a common point of view when opponents adhere only to one side of the discussion. They are either unreservedly "pro" or uncompromisingly "con". But it is the fact that conflictive elements are converging which makes the problem complex. And we must not close our eyes to those factors which complicate the problem. On the contrary, we must clearly see them. We must make decisions knowledgeably, with knowledge of all aspects of the issue. We must seek ways to surmount opposing trends, cautiously and thoughtfully finding ways out of what would seem to be impasse situations.

I ask myself the question: "Am I personally for or against training to fly nap-of-the-earth?" I discover that I have no unequivocal answer. I suspect that there can be no unequivocal answer.

For example, there are pilots in the squadron who are ready and willing to master low-level flying. It is necessary to master—this is the very first thought which determines my attitude toward this type of flying. But it turns out that for various reasons there are no experienced instructors at the present time: personnel reassignments, personnel replacement, being out of practice, etc—there are many variations. Is it possible at this stage to assign the squadron's pilots the task of mastering low-level flight? The first question as regards flight operations dealing with any new type of training evidently should be the following: is the task that is being considered actually reasonable and realistic? Many aspects require analysis. Readiness on the part of the pilots, availability of instructors, anticipated long-range weather forecast, the specific features of the area in which the base is located, the navigation situation, seasonal bird-strike hazards, plus many other aspects.

But perhaps ensured flight safety should always be the determining factor.

We shall attempt to analyze several factors affecting low-level flying.

A system of expert appraisals of the possibility of flying at low level in relation to aircraft speed has been obtained as a result of flight experimentation, the so-called Tsuvarev scale. It is shown in Figure 1.

Of course this graph provides more of a qualitative picture than a quantitative estimate, but nevertheless a pilot can obtain a general idea on how flying will be with a specific combination of height above ground level and aircraft speed. For example, at a height of 50 meters and a speed of 500 km/h, the subjective state rating is close to excellent. But it is only close to satisfactory at the same height at a speed of 1,100 km/h.

Interesting results were also obtained in determining the mathematical expectation of error in maintaining the desired height in relation to height above ground level (Figure 2).

I hope it is clear to pilots that distraction of attention from monitoring height above ground level is not caused by plain negligence or indiscipline. A pilot's attention during flight is distributed among a great many items and is taken up not only by tasks pertaining specifically to flying the aircraft. Therefore distractions are inevitable, and even essential in the interests of performing the mission.

Finally the question is asked: is it actually possible to maintain a specified height above ground level without deviations? And using what instrument? It would seem

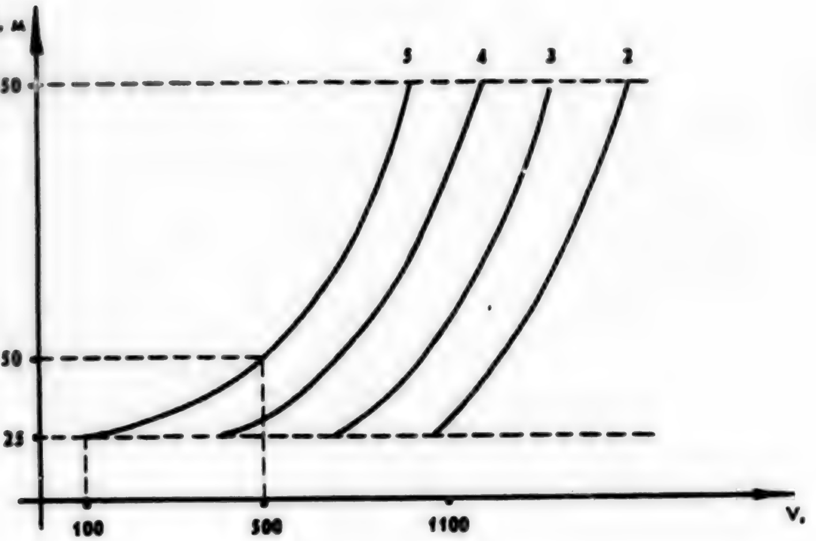

Figure 1.

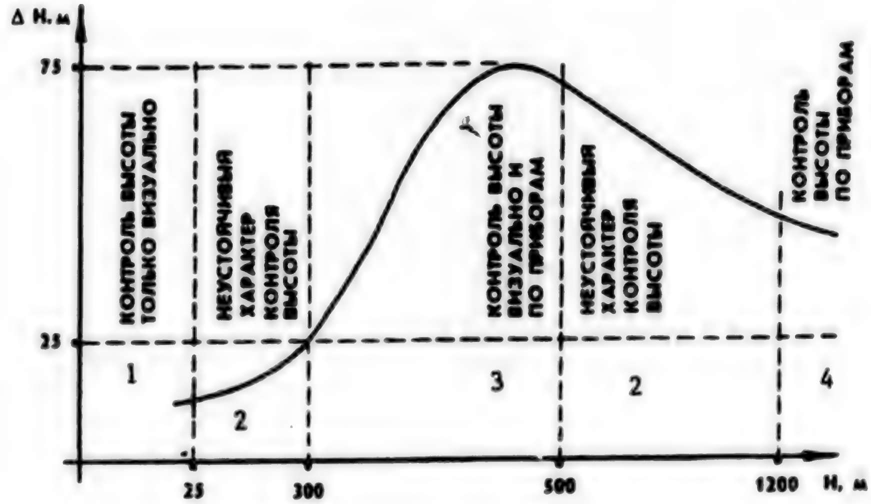

Figure 2.

Key: 1. Monitoring altitude only visually; 2. Unstable nature of monitoring altitude; 3. Monitoring altitude visually and by instrument; 4. Monitoring altitude by instrument

that this task is best accomplished using the radar altimeter. However.... If the aircraft is banking, the height reading will be incorrect. In addition, a radar altimeter measures height above ground level at a given instant and says nothing about what can be expected a few seconds hence.

What we have stated to this point is for the purpose of showing that mastering low-level flight is a complicated problem. It is a psychological and technical problem, not only an organizational problem, where the commander decides whether he is for it or against it.

I would like to share some observations which in my opinion can contribute to safe low-level flying.

Experience indicates that it is not advisable to specify to a pilot an absolutely specific height above ground level.

One of the reasons for poorly holding altitude is the discrepancy between actual and required forces or pressure on the stick or yoke. Error in height above ground level can be calculated with the formula:

$$\Delta H = g \frac{\Delta P_6}{2 P_6^{n_y}} t^2 + V \sin \Delta \theta t,$$

where ΔP_6 is the discrepancy between trim and actual pressures; $P_6^{n_y}$ is force required to produce one G; $\Delta\theta$ is error in holding flight path angle in degrees.

We shall specify flight conditions: V = 720 km/h (200 m/s); $\Delta\theta$ =1 degree; P_6 = 5 kg, $P_6^{n_y}$ =3 kg. Altitude deviations in relation to time during which attention is diverted from monitoring altitude are contained in the table:

t, c	2	3	4	5
ΔH_6, м	7	15	27	41
ΔH_θ, м	7	10	14	17
ΔH	14	25	41	58

It is virtually impossible precisely to maintain a specified height. An aircraft being flown by a human pilot can never (could not keep up!) follow all terrain contours and irregularities. Secondly, the endeavor to maintain an absolute precise height (as any other parameter) shackles the pilot's attention to the instruments. And this is much more dangerous than any deviations in maintaining height which do not lead to failure to maintain some absolutely safe value for the given flight.

Realistically the commander must specify the general flight level: low [malaya—200-1,000 meters agl] or very low [predelno malaya—less than 200 m agl] level. The pilot should not focus on a specific height but rather on sufficient height to ensure mission safety. Of course experience is necessary in order to acquire the skills and ability to fly in conformity with the suggested principle of maintaining height, experience which is gained only in the course of performance-graded flights and practice flights.

Selection of route of low-level flight and preparation for a specific flight is very important. I shall not repeat the obvious. I shall discuss three elements.

First, I feel that it is advisable to display methodological boldness and to refrain from always laying out straight-line travel between waypoints or steerpoints. Of course straight-line flight has its advantages: it is easier to maintain flight configuration, course, and timetable. But often this is only an apparent advantage. Let us say, for example, that a given flight path crosses a lake where there are a lot of birds. It is obvious that it would be better to bypass such an area. Or let us say that a flight ties to a linear terrain feature which has numerous bends. If one follows a strictly straight line, it will be necessary to cross this terrain feature several times. One could easily lose it. Would it not be better to follow some of the bends (it would be out of the question to follow all of them)? Of course one can come back with the rejoinder: subdivide the route segment up into several subsegments, and you will get straight flight paths. But a route consisting of a large number of waypoints is another, scarcely warranted complication.

It would seem that such an approach would bring into question whether one would be able to initiate the target approach precisely on schedule. But this problem is easily surmountable if one has a well-prepared time adjustment table keyed to waypoint or steerpoint passage.

Secondly, what one needs are not a few isolated landmarks but a sure and effective system of landmarks. They should be selected in such a manner as maximally to simplify the search for the next one during passage of

the preceding one, in order to line up an interlinked chain of readily-identifiable terrain features. A map is not sufficient for this. One needs mission-plotting photomaps and thorough knowledge of the area of operations; one must have a precise, accurate mental picture of the structure of the operations area, placing a well though-through logical grid on the terrain, as it were. Only then will a system of terrain features appear, and consequently only then will one achieve sure, confident low-level navigation.

Third, knowledge of natural and manmade obstacles is of particular importance for flight safety. And not just knowledge isolated from other factors, but within a framework of readily-identifiable, extremely prominent terrain features, which one simply cannot fail to notice.

Of course selection of a low-level route is a complicated, critical activity which requires creativity and multiple-variation planning.

I have touched upon only a few items. The main thing, however, is that this question should not be approached in a routine, predictable, unoriginal manner, as has become customary. Everything done on the ground should serve to simplify the pilot's job in the air. For this reason one must ask oneself a hundred times: "What else can be simplified? Has everything been done in a purposeful manner in the interests of flight safety?"

I should like to touch upon two perhaps quite obvious nuances.

When any problem arises, it is advisable for the pilot first of all to climb to a higher altitude. This should be the dominant psychological mindset. Just as the fact that all operations which increase pilot attention requirements should be performed only after establishing a climb.

Low and extremely low altitudes.... I do not feel that the question of whether or not pilots should master low-level flying skills is appropriate. We are dealing with a quite different problem here: how to master low-level flying without any detriment to flight safety, and in the interests of combat proficiency.

Psychologist Analyzes Pilot Spatial Orientation

91441273d Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 12-13

[Article, published under the heading "Flying and Psychology," by Yu. Shipkov, psychologist: "Spatial Orientation and Motion"]

[Text] Much has been written about spatial orientation and three-dimentional situational awareness, and so often, that it would seem that everything to be said about it has been said. And yet the appearance of counterpart studies suggests that a certain crisis has developed in research on this topic, which is perceptible primarily in the theoretical domain. Uncertainty about the nature of the relationship between spatial orientation and the content of a pilot's individual activities constitutes its principal expression. The point is not that the authors of studies deny the existence of such a linkage. On the contrary, they make every effort to stress its existence. In addition, they point out that it is of the nature of regulation. The point lies elsewhere: it is not clear just what regulation is.

These difficulties are perhaps engendered by the method of describing a pilot's activity. It is viewed as flying the aircraft, that is, as a set of operations performed by the pilot pertaining to controlling the aircraft. Naturally the regulative aspect is represented in such a description by a set of mental operations. In other words the process aspect of the pilot's activity is subjected to analysis, while the content aspect escapes one's attention. This is absolutely inevitable, for in this case that which the pilot is doing with his hands and feet is detached from that which is being done by the machine. As a result of this procedure the machine is viewed as something which is at the very least equivalent to the pilot, as that between the pilot and which it is possible to distribute functions. The machine is responsible for flight parameters output, and the pilot is responsible for ensuring that they correspond to some standard. We feel that this does not agree with the true picture of flight.

In no science has an operational approach been able to become the basis of methodology. Nor is it likely to be useful to rely on this approach in aviation psychology. In order to gain ground under foot and to secure prospects for future investigations, we must change formulation of the question: in place of "how" we must ask "what." What does the expression "a pilot flies" signify? The answer "he pilots" is incorrect. This is an answer to the question "how." Let us turn to common sense in order to surmount these semantic difficulties.

The entire aggregate of actual actions taken by the pilot on the aircraft boils down to acting on the controls, and through them affecting the airframe's geometry and the state of the powerplant. Both are limited to redistribution of forces acting on the aircraft. The pilot is unable to achieve anything greater than that by piloting or aircraft-controlling operations.

But it would seem that during flight the pilot is least of all concerned by what he is directly engaged in pertaining to the aircraft. He is plotting motion, his own motion in the surrounding medium. The pilot flies. We return once again to the question: what does this expression mean? It is now obvious to us that flying is not merely piloting. The forces applied to the aircraft from the moment of liftoff to the moment of touchdown are determined by its path of movement through the air above the ground. The interaction of the airframe with the airstream and the ground is per se a phenomenon independent of a human operator. Thus the pilot during flight merely creates the conditions for change, in a direction desirable to him, in

the results of interaction between aircraft and airstream, of course if one ignores the interesting fact that no airplane exists without the pilot's operating system. In fact, where have you seen an airplane flying by itself (not launched by man)? This could be imagined only if the pilot's hands, at the moment they act upon the aircraft controls, constitute elements of the aircraft's mechanics, one of its components.

In determining the question of flying, we are compelled to draw attention to a fact which is rarely noted in an operational description of a pilot's activity. In a certain sense the pilot is transported as an object aboard the aircraft and moves together with the aircraft. This is not noted when the investigator who is studying a pilot in flight is an observer who is rigidly bound to the pilot. The entire time he is sitting in the same seat with him, as it were. In actuality sensors affixed to the pilot represent such an observer. The described passive movement through the air of course cannot be called "flight," but strictly speaking it differs in no way from the flight of an Aeroflot passenger, and therefore says nothing to us about the content of the expression "a pilot flies."

Thus the pilot's motions relative to the aircraft (control movements), the aircraft's movement proper, and carriage of the pilot by the aircraft, while exhausting the range of perceived motions, clearly do not jibe with one another in such a manner as to clarify the meaning of the term "flight." And yet the key to solving the problem lies on the surface. Man does not possess the physical capability to fly. But an aircraft also does not possess such capability. Only an unequal synthesis of the two possesses the capability of flignt. Man incorporates the machine within himself and transforms its motion into a structural "addition" to his own motion, although in a physical sense with his control actions man merely is creating the conditions for change in the nature of interaction between aircraft, airstream, and the ground. But the most important thing in the physics of the phenomenon here is the results. They are foreseen by man, prepared for by him, and engendered in his activity. The fact is that mechanisms outside of physics are superimposed on the physics of the phenomenon, not breaking it but merely giving it some definite form. This is what provides the basis for assuming the existence of a high-order structure into which physics is incorporated and within the framework of which the fine coordination of the phenomenon of flight takes place. This structure, which can be conceived intellectually but which is difficult to represent graphically, should be called the motion of the human operator aboard the aircraft. It is very important here to understand that the customary phrase "man flies the airplane," which suggests itself from the above discussion, is a metaphor to a substantially greater degree than any phrase of the type "the airplane flies within the human operator." Man does not simply "adhere" to the motion of other objects; he guides this motion, making it into his own motion. Man's motion becomes expressed indirectly.

Thus while at the level of piloting, that is controlling the aircraft, the pilot redistributes the forces acting on the aircraft, and while at the level of aircraft displacement the pilot monitors this displacement, that is, perceives it and analyzes it with the aid of instruments, at the level of motion proper the pilot constructs motion. Constructing motion presupposes coordination of the processes at various levels and consideration of the circumstances of their coordinated execution. Consideration in motion of the circumstances of its execution bears the name spatial orientation, for motion represents a phenomenon of overcoming the spatial separation between man and the object of his interest. While in the case of a pedestrian constructing motion it is sufficient to take into account the location of the immediate supporting surface and the arrangement of objects connected with it, the pilot must also take into consideration the motion of his immediate supporting surface (the airframe) relative to the ground and the airstream. Thus the fact that motion through the air is made indirect using the aircraft causes corresponding transformations in spatial orientation.

When pilot spatial orientation is discussed, it is frequently characterized as an indirect expression, bearing in mind that fact that the pilot needs additional means to accomplish it—the performance instruments. But it is by no means instruments which determine the indirectness of expression in this case. It is determined by signs and by text. Consequently the perception capabilities to which the pedestrian was limited in spatial orientation are insufficient for the pilot. This occurs because in man's perception as a terrestrial being, his motor activity is represented in a terrestrial environment, that is, everything that is perceived by man is perceived in light of the patterns and mechanisms of man's displacement of his body across the ground surface, while these patterns and mechanisms proper are realized in the structure of the locomotor system of the human organism.

The laws governing the motion of an airframe in the air medium apply only to the airframe. For man they are predetermined. They must therefore be established in advance, subsequently coordinating one's own control motions with aircraft displacement in the air medium in conformity with these governing laws. Strictly speaking, the indirectness of expression of spatial orientation applies primarily to indirect expression by knowledge of the laws governing those phenomena which the pilot has determined to utilize. In other words the term "indirect expression" correlates to a so-called "conceptual model of flight," not to instrument-derived information. The laws which govern aircraft flight are not presented to perception when observing the situation beyond the cockpit, and they are not represented on the instruments. For this reason the pilot constantly keeps them in his head as well as in the form of a trace (engram) of control movements. But this picture can lead only to disaster if the mental model which corresponds to it is not utilized to interpret the perceived information.

Thus both the pedestrian and the pilot perceive not merely the external environment, not merely space, but a three-dimensional plot of motion. Variations of actions within the spatial circumstances of performance of motion are perceived and mentally comprehended. We repeat: spatial orientation is a method of taking into account during motion the circumstances of execution of that motion. No other methods exist.

Consideration of the circumstances of motion consists in the fact that variations of path within the medium are perceived, among which the preferable variant is selected. But while it is perceived directly by the pedestrian, the pilot perceives it indirectly, that is, grasps it mentally. He plots a flight path in advance. And this flight path is plotted in mental, ideal space. Walking through air combat with models, a flight path drawn on a sheet of paper, and the decision "turn" which instantaneously arises in one's mind are variations of an equally abstract setting of one's motion in flight, to which a certain invariant of the control deflection pattern corresponds. Even if some numeric values, that is, specific quantities are involved in creating a flight path program, these will be specific quantities of ideal space. For example, initial conditions and parameters of dive pullout or recovery may be specified. But their precise observance, not in the ideal space of a plan but in an actual flight environment, may be only an extraordinary occurrence, since that which in ideal space constitutes a point with accurate coordinates, in the actual air medium is represented by some proximity of the desired location.

Orientation in ideal space, which signifies the flight environment, is a preliminary condition and an essential means of spatial orientation during actual flight. It exists in the form of a maximally abstract verbal designation, in the form of a visualized flight path, and in the form of a specified pattern of control motions. It is specified internally, as it were. But when the pilot places himself in the aircraft cockpit, the environment immediately becomes external. But without preliminary "internal," it is impossible to analyze subsequent "external." The pilot is faced with the task of embodying intended motion in actual circumstances. An infinite number of actual flight paths will correspond to a single conceived flight path. It follows from what has been stated above that only in rare instances can pilot performance of a flight assignment be viewed as countering a discrepancy between one's true and desired position. Most frequently it is important to follow not the specific value of a specific parameter but rather the aggregate dynamics of many parameters, seeking to retain some invariant of motion which corresponds to the desired flight path. We can state that in an actual flight its abstract elements are gradually immersed in specific texture and manner, becoming embodied in it.

That which we have just discussed is described to some degree by the term "goal image," while the process of its immersion into specific texture and manner is akin to transition from goal image to operational images. But this is only a vertical slice of spatial orientation. It is viewed as an evolving whole, although this concept is also not entirely appropriate in regard to mental reality. That which exists at the beginning of a flight and that which results at the end are one and the same thing, but at different stages of development: scheme and embodiment. But one can also see a horizontal component in spatial orientation. Even the most abstract initial, preparatory stage is perceived in one's mind in some graphic form. That which a person perceives in graphic images is essentially a product of remembrances and imagination. As the flight progresses, these pictures are gradually supplanted by realistic products of perception. They are also supplanted by the experience of monotonous flights in a repeating situation. A horizontal section of spatial orientation can be called transition from imagination to actuality.

Spatial orientation is dynamic not only in the process of a given specific activity but also has a history, that is, it evolves from one act of activity to another. The highest form of development of spatial orientation is well known. It is a so-called "feeling of the aircraft." This is essentially a stage of coordination of the pilot's own activity with the dynamics of the transient processes of the aircraft, characterized by transition to a level of perception of many functions which at early stages in one's professional career required extensive mental operations. A "feeling of the aircraft" is developed due to the fact that in preceding activities involving mastering the technique of flying, the pilot "tested" a great many deviations from some desired pattern of a given control movement, which were caused by various internal and external interference. They were all "eliminated," and now for any unforeseen deviation in the course of plotting motion, the pilot has a set of corresponding sensory corrections correlated with the apparent consequences of motion. We should note that technologically piloting an aircraft comprises a process of mentally constructing basic motions, that is, corresponding to the pattern of control motions, with subsequent correction on the basis of instruments or the cockpit-exterior situation.

We should make special mention of instrument-derived information. Instruments represent text to the pilot. He can read this text only if he has been taught techniques of interpretation, that is, he understands symbols and the rules and procedures of responding to them, and also understands that in reading it is important not so much to pay attention to the symbols as to follow their content. Reality is opened up to man with the help of symbols: reality itself and as instructions to the user of the symbols. In the latter instance the reader does not know what the content of the text is, but he understands how he should act. During loss and reduction of spatial orientation during instrument flight, the pilot correlates with the instruments precisely as with bearers of text-instructions. This situation is designated as a "branching image."

Spatial orientation is essentially that image of flight which regulates the pilot's activity. During flight, however, a pilot may perform a number of functions which, while constituting job-related duties, are non-flight functions. For example, when an emergency situation arises aboard the aircraft, for purely technical reasons the person who responds to these technical problems will

constitute an engineer, whose activity is regulated by an image other than the flight image, an image which can be called a technical situation image.

Our understanding of spatial orientation will be incomplete if we fail to consider the fact that during different flights (and even during a single flight) a pilot may construct motion in different spatial systems. When flying as a single-aircraft element he utilizes an ideal three-dimensional model of space for three-dimensional situational awareness in the actual flight environment. When attacking a threat aircraft he uses a spherical coordinate system the point of reference of which coincides with the point of observation. In close formation, for the wingman that same spherical coordinate system is rigidly bound to the solid angle of the element leader's aircraft. Obviously spatial orientation will be different in all such situations.

Thus we have examined spatial orientation as an internal element of motion and linked it to the specific features of this motion and that environment in which it develops. But we have only lightly touched upon the matter of transformations which affect mental functions. This is a topic for separate study and investigation.

Interethnic Harmony Efforts at Borisoglebsk Flight School

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[Article, published under the heading "Problems of Training and Indoctrination," by Lt Col N. Mikhaylov, political section senior instructor, Borisoglebsk Red-Banner Higher Military Aviation School for Pilots imeni V. P. Chkalov: "Our Priceless Asset"]

[Text] In discussing the problems of restructuring the system of patriotic and internationalist indoctrination of Air Force personnel, I should like to note that the need to master new approaches to resolving these problems is also being increasingly more acutely felt today at military educational institutions.

Military personnel of more than 40 nationalities and ethnic groups, for example, serve at the Borisoglebsk Red-Banner Higher Military Aviation School for Pilots imeni V. P. Chkalov. When organizing training and indoctrination activities, commanders, political workers, teachers and instructors, party and Komsomol activists must take into consideration this multiethnic composition of the subunits and services.

One can single out two main, closely interlinked areas within the system of patriotic and internationalist indoctrination currently functioning at the school. One is ideological work, the purpose of which is to form in personnel firm convictions, correct views and ideas about the nationalities question and ways to resolve it, as well as concern with creating in the collective a moral atmosphere and social environment which maximally promotes development in Air Force personnel of patriotic and internationalist sentiments and high standards of interethnic intercommunication.

Practical realities demand of us an ever deeper understanding of the practical aspects of internationalist and patriotic indoctrination, renewal of its content, forms and methods, objective analysis of the state of affairs in each subunit, the causes of noted trends, and elaboration on this basis of effective measures to influence people's consciousness and behavior. We are well aware that substantive work can be performed with military personnel of different nationalities and ethnic groups only if we possess the requisite knowledge of and as much informational and illustrative material as possible on the past and present, the economic, intellectual and spiritual affairs, the customs and traditions of peoples.

We possess such resources at this school. They are constantly being added to and improved. How is this being accomplished? We have established good working and productive relations with the Komsomol central committees of the union republics, krays and oblasts. Responding to the request of Air Force personnel, the youth organizations send us a great deal of sociopolitical and imaginative literature, records and tapes, posters and booklets, as well as other materials.

Exchange of information is being carried out on a mutual basis. Commanders, political workers, and Komsomol activists correspond with the families of our cadets, NCOs and primary-rank enlisted personnel, with workforces, schools, and Komsomol committees, send photographs, leaflets, and newspaper clippings telling about the studies and military service of personnel from a given republic, oblast, city, or village. This provides a great deal not only to our enlisted personnel and cadets but also to those who will soon be joining their ranks. Internationalist indoctrination corners have been formed in each subunit, with books and files of newspapers and magazines in the languages of the peoples of the USSR, maps, posters, and other visual agitation materials. As we know, the effectiveness of propaganda and mass agitation efforts in the area of internationalist indoctrination is determined in large measure by how deeply and fully the ideas and principles of friendship among peoples and military comradeship permeate the daily life of the multiethnic collective and influence accomplishment of the main task—training of flight personnel.

In view of this fact, the school's command element and political section have begun devoting more attention to ethnic makeup in forming subunits and training groups. There are no special secrets here. We make use of know-how and experience in achieving psychological compatibility in groups, we take into consideration individuals' desire to serve together, as well as other factors of social and personal significance. This approach to resolving problems of interethnic intercommunication at

the stage of forming subunits is proving fully effective. We have many examples of this.

In the training regiment with which Lt Col I. Agafonov serves, as a rule interethnic crews are formed for the period of cadet practical flight training. For example, Moldavian Jr Sgt B. Rotar, Armenian Cadet A. Nazaretyan, and Russian Cadet V. Mironov were assigned to instructor pilot Capt Yu. Ryabov. The ground crew included aircraft technician [crew chief] Belorussian S. Romanyuk and mechanics Armenian M. Apresyan, Tajik E. Salomov, and Pole V. Strenovich. The men's collective responsibility for high-quality performance of their assigned tasks, the friendly relations established among cadets and enlisted personnel, their assistance to one another and the healthy comradely rivalry within a crew and with neighboring crews contributed greatly to successful completion of the training program by the future pilots.

Such groups give us a good opportunity to observe, to study the processes of interethnic intercommunication, and to develop methods of controlling these processes and influencing their course and end results. And of course the moral example of friendly, cohesive multiethnic collectives is also of great importance.

Skilled organization of the leisure time activities of personnel also has a beneficial effect on indoctrination and development of patriotic and internationalist awareness. Special morning and evening activities entitled "Introducing Myself to the Group" are not a new form of intercommunication among servicemen, but it is continuing to accomplish good results. At our school we frequently hold quiz games and competitions for best knowledge of life in the brother union republics, their history and present day, national traditions and customs, literature and music.

Good experience in honoring outstanding performance in training and socialist competition in multiethnic units has been amassed in the subunit with which Lt Col G. Kurochkin serves. In this subunit all activities connected with announcing and awarding winners as well as exchange of experience and know-how are scheduled for an evening event, for which an appropriate program, scenario, artistic and musical touches are prepared. The men attend these events as if they were genuine holiday activities, not a routine reading of commendations.

Get-togethers between our people and internationalist military personnel are becoming a fine tradition. Maj V. Mustafeyev, for example, who was twice awarded the Order of the Red Star for courage in the skies over Afghanistan, frequently visits the subunits. He is a Kazakh by nationality, and you should see the attentiveness and pride with which Kazakh soldiers and members of other nationalities and ethnic groups, enrolled as cadets or doing their compulsory military service at the school, look at this officer and listen to him.

The fact that commanders, political workers, party and Komsomol activists at the school have begun seriously addressing matters connected with influence on the moral and ethical microclimate within common-nationality groups in the subunits also attests to increased attention toward problems of interethnic intercommunication in the units and an endeavor to resolve this problem not with words but with deeds.

Traditionally the fact of a group of persons native to the same region, as a phenomenon of community and military affairs, contained many positive elements. In the initial period a person hailing from the same region would frequently function as a big brother and good friend to a young recruit. Unfortunately with time negative aspects of this phenomenon became intensified. For this reason we are presently thinking about and working on how we can do a better and faster job of making the process of forming of groups of personnel hailing from the same region controllable and focused on strengthening friendship and esprit de corps among personnel, as well as development of a sense of internationalism.

One area we are working in is enhancement of the role and influence of Komsomol activists in the subunits. It is Komsomol activists, not the self-appointed "leaders" of these regional-native groups who should be the genuine leaders in youth collectives. The forming of elected Komsomol officials and the forming of a body of activists of public organizations taking into account the ethnic composition of a company, squadron, and battalion exerts positive influence on accomplishing this and other tasks connected with strengthening internationalist indoctrination. In the subunit in which Sr Lt S. Stolyar serves as deputy commander for political affairs, for example, individuals of six nationalities and ethnic groups were elected to the Komsomol buro. The remainder were enlisted to volunteer activities via the Lenin Room council, wall newspaper editorial boards, and public oversight post. The fact that the sergeants and other enlisted personnel of various nationalities and ethnic groups take part as much as possible in the affairs of the collective, the fact that there is a need for constant intercommunication in the course of performing work assignments and tasks, as well as other factors directly or indirectly influence strengthening of friendship and military comradeship. In this collective there are no interethnic conflicts.

Poor knowledge of the Russian language by many young soldiers from the republics of Central Asia and the Transcaucasus continues to be the most acute problem for us in the area of internationalist indoctrination. What is being done in the school's subunits to surmount the language barrier? At the present time we are improving and broadening the functions of the mentorship method. An officer, warrant officer, noncommissioned officer or primary-rank enlisted man responsible for the technical and military training and indoctrination of a subordinate or colleague is supposed to teach him Russian at the same time. Mentoring activities have been set up in the Komsomol organizations. The Komsomol buros of the subunits with which officers A.

Tokarenko, V. Gorobets, and O. Mukhin serve have made sure that not one airman with a poor knowledge of Russian is being left without attention and assistance. All mentoring activities here are under commander and buro member oversight.

These may only be half-measures, but nevertheless in some measure they help in accomplishing training and indoctrination tasks and in maintaining healthy morale in the units.

I am convinced that as the processes of restructuring of ideological and political indoctrination work become more intensive, and as commanders, political workers, party and Komsomol activists master new approaches to internationalist indoctrination of Air Force personnel, our activities in this area will become more effective, meeting the party's program guidelines pertaining to the nationalities question.

Air Force Engineering Academy Introduces New Six-Year Curriculum

91441273f Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 18-19

[Article, published under the heading "From the Schoolroom to the Academy," by Maj Gen Avn V. Bogdanov, deputy commanding officer, Air Force Engineering Academy imeni N. Ye. Zhukovskiy: "Talent Required"]

[Text] **This year for the first time screening and selection of first-year cadets will be conducted at the Air Force Engineering Academy imeni N. Ye. Zhukovskiy.**

* * *

There is one feature of this famed academy: veteran pilots, noted cosmonauts, and youths dreaming of dedicating their lives to military aviation receive instruction in its lecture halls and laboratories.

This year, at a traditional formation held in the interior courtyard of the Petrovskiy Palace, located on Moscow's Leningradskiy Prospekt, the academy commanding officer and distinguished academy graduates once again will greet this year's arriving students. This time, alongside officers there will be officer candidates—secondary-school graduates who have successfully passed the entrance examinations and who have made it through the competitive selection process, including compulsory-service personnel, civilian youths, and military reservists who have completed their active military service obligation and who possess a secondary education.

The history of this school is part of the history of our country's Air Force. In the fall of 1919 the Soviet Government, headed by V. I. Lenin, supported a proposal by professor N. Ye. Zhukovskiy, the "father of Russian aviation," to establish a Moscow aviation technical school, which in 1920 was reorganized into the Red Air Force Engineers' Institute, and in 1922 into the Air Force Academy. Since that distant time it has borne the name of its first rector, our great fellow countryman, scientist and patriot Nikolay Yegorovich Zhukovskiy. It was from here, from the Petrovskiy Palace, which by order of the Revolutionary Military Council dated 17 September 1923 was renamed the Red Aviation Palace, the young Soviet Republic took its first steps skyward.

From the beginning of its existence up to 1940, the academy was the country's sole higher military aviation school, training not only engineers but also command cadres with higher education for the Armed Forces. For a long time it was also the only higher educational institution training aviation engineers. Its graduates were assigned not only to the military but also to aviation industry enterprises, to design offices, and to scientific research institutes.

Many academy alumni became prominent aviation industry leaders, famed scientists and aircraft designers. World-famous aircraft and aircraft engine designers S. Ilyushin, A. Mikoyan, A. Yakovlev, V. Bolkhovitinov, A. Rafaelyants, N. Kuznetsov, and S. Tumanskiy have inscribed their names with gold letters into the history of the academy, and B. Stechkin, B. Yuryev, V. Vetchinkin, and others ushered them into the science of aviation.

During the years of the Great Patriotic War all academy activities were devoted to the struggle for victory over the fascist invaders. The academy's graduates were put to a hard practical test of readiness. Serving in various positions, they passed all tests with flying colors, working in difficult conditions. Academy graduates headed the Air Force, commanded Air Force combined units, directed the aviation engineer service at all echelons, designed new combat aircraft and aircraft engines, headed the aviation branches of industry, and directed scientific institutes and industrial plants. Thousands of academy graduates were awarded high government decorations. Many gave their lives in the struggle against our enemies.

The academy faculty and staff also made a major contribution toward development of new jet aircraft and training engineer cadres in the postwar period.

At the beginning of the 1960's the academy performed an assigned task with honor: providing engineering training to Soviet pilot-cosmonauts. Fourteen space explorers of that first, illustrious detachment are academy graduates. They include the world's first cosmonaut, Hero of the Soviet Union Yuriy Alekseyevich Gagarin, and the second man in space, German Stepanovich Titov.

There is not a single page in the history of Soviet aviation in the writing of which graduates of the Academy imeni N. Ye. Zhukovskiy have not taken part. 102 graduates have been named Hero of the Soviet Union and Hero of Socialist Labor, while 17 individuals were twice awarded

this honorary title. Graduates include 89 Lenin Prize and State Prize recipients and 16 academicians and corresponding members of the USSR Academy of Sciences.

The academy's fruitful activities have won high praise from the homeland. The academy colors bear the Order of Lenin, the Order of the October Revolution, and the Order of the Red Banner. Many officers from the People's Republic of Bulgaria, GDR, Socialist Republic of Vietnam, the Polish People's Republic, and other countries have received training at the academy.

Today the academy not only trains Air Force engineer personnel but is also a major aviation scientific center, where all principal research areas connected with aviation are being developed. Fighting and labor traditions are carefully preserved at the academy. More than 70 doctors of sciences and professors and approximately 400 candidates of sciences pass on their knowledge to new generations of aviation specialists. Students learn firsthand about all new developments in aviation.

Beginning in 1989, the academy will be training military engineers in particularly complex, science-intensive areas of specialization, involving a six-year curriculum. Military personnel fulfilling their compulsory service obligation, civilian youths, and military reservists who have completed their active military service may apply for admission. Normal application procedures will be followed: military personnel may apply through their units and combined units, while all others shall apply through the military commissariat in their locality of residence. Entrance examinations will be given between 10 and 30 July: in Russian language and literature (written), mathematics (written), physics (written), history of the USSR, and a foreign language.

We should note the following important point. Since the curriculum is rather complex and enrollment will be limited, the selection process will be particularly thorough. In order to handle the curriculum it will be necessary not only to possess diversified, profound knowledge but also an analytical mind and creative ability. We hope that gifted, talented youths inclined toward the exact sciences and technical innovation: winners of physics and mathematics Olympiads held for general-curriculum secondary school and specialized trade and technical school students, young inventors and efficiency innovators, and amateur designers—will join the corps of cadets.

Academy graduates, upon completing this curriculum, will for the most part probably be assigned to scientific research and testing establishments as well as military educational institutions.

Estimating Visibility on Landing Approach

91441273g Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 20-21

[Article, published under the heading "Flight Safety: Specialist Advice," by Lt Col O. Zubkov, candidate of Technical Sciences: "Estimating Visibility on Landing Approach"]

[Text]

At first glance the matter of visibility on the landing approach would seem to be rather straightforward. It would seem sufficient to study the documents which govern flight operations and procedures in order to answer this question. In weather service practice, however, various interpretations of visibility on landing approach are encountered. In some instances it is interpreted as slant-range visibility, in others as flight visibility, and in other instances, due to a shallow glideslope angle, as visibility on the runway or runway visual range. Such an approach cannot satisfy flight safety requirements, especially when operating fourth-generation aircraft and with transition to lower weather minimums.

What determines visibility on landing approach? Of course the main, determining factors are weather conditions: percentage of cloud cover and height of cloud bases, as well as atmospheric phenomena which affect visibility. But one must also consider the type of aircraft, peculiarities of cockpit windshield and

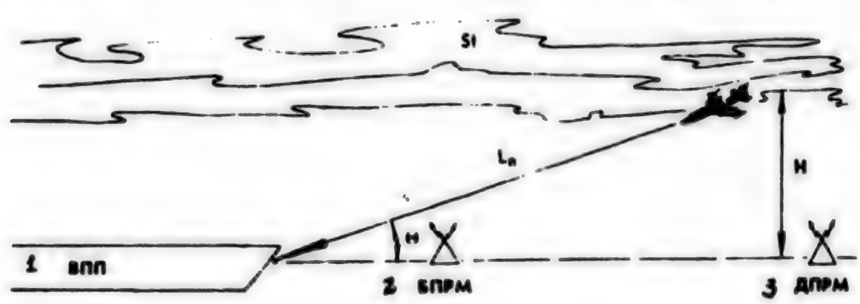


Figure 1. Relationship Between Visibility on Landing Approach (L_n), Height (H) of Low Stratiform Clouds (St), and Landing Approach Glidepath Angle (θ).

Key: 1. Runway; 2. Middle compass locator/middle marker; 3. Outer compass locator/outer marker

pilot gear, airspeed and nose pitch angle on final approach course, direction of final approach course, and sun position. Visibility on landing approach L_n is also determined by final approach glideslope angle Θ (Figure 1).

Even with identical weather conditions and types of aircraft, visibility on landing approach may be estimated differently at airfields with different glideslope angles. Nor can one ignore the subjective factor. Generally a pilot who is landing at a familiar airfield will spot the runway threshold sooner, that is at a greater distance than at a field where he is landing for the first time.

Thus visibility on landing approach depends on many factors and cannot be determined unequivocally. Plotting landing approach visibility estimate nomograms by types of aircraft could become an optimal approach to synthesizing performed studies from this standpoint.

Figure 2 contains an example of such a nomogram for fighter-bomber aircraft based at airfields with a glideslope angle of 2 degrees 40 minutes. This nomogram, which is based on considerable statistical material, makes it possible quickly to determine visibility on landing approach during daylight, depending on horizontal visibility, height of cloud bases, and weather conditions. Meteorologists have all this information available at all times.

As we know, height measurements of cloud bases, made by aircraft $H_{сам}$ and by lidar $H_{сл}$, differ from one another. Due to uneven cloud bases, haze or precipitation under the cloud cover, and high airspeed, a pilot as a rule "understates" the actual cloud base height. From the standpoint of flight safety, however, this must be considered when determining landing visibility. Flight experimentation indicates that with 80 to 100 percent low stratiform cloud cover, maximum differences in measurement between $H_{сл}$ and $H_{сам}$ occur at heights of 100-300 meters, while measurements practically coincide at heights above 600 meters. Such a correction to determination of height of cloud bases is made in the fourth quadrant of the nomogram.

Limiting ourselves to the linear region of the relation and a degree of accuracy and cloud base height $(100 \leqslant H \leqslant 600 \text{ м})$ sufficient for practical purposes, we can show that in this case an experimental relationship between difference in height measurements is determined as follows:

$$H_{сам} = 1{,}05\ H_{сл} - 30.$$

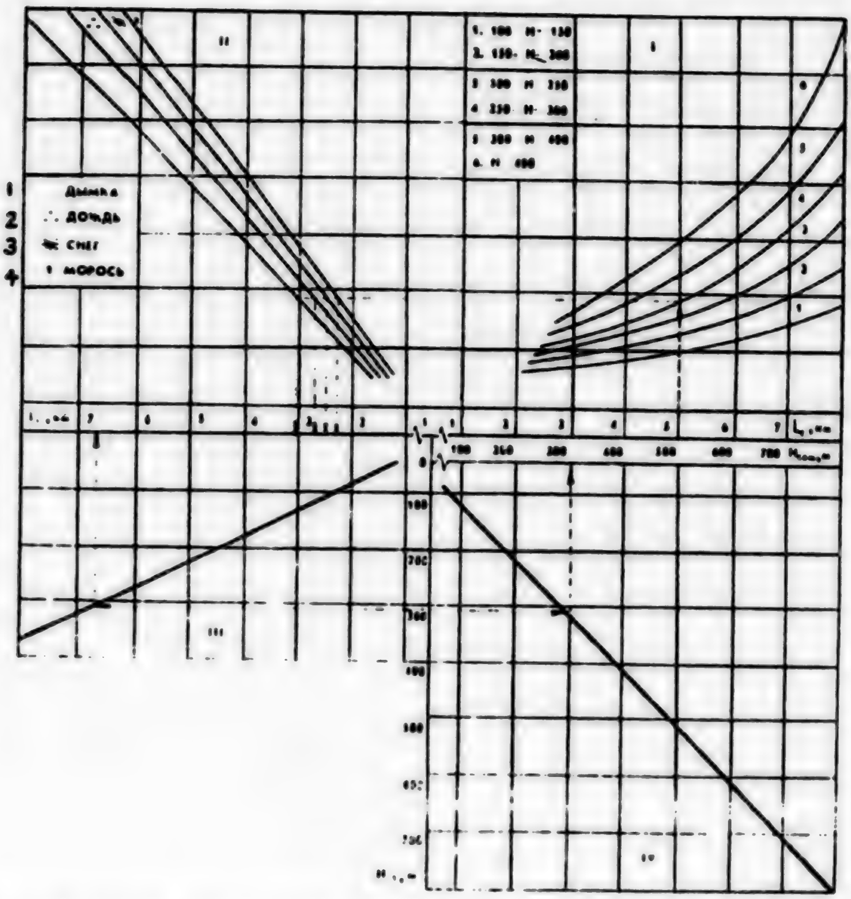


Figure 2. Visibility on Landing Approach Estimate Nomogram for Fighter-Bomber Aircraft.

Key: 1. Haze; 2. Rain; 3. Snow; 4. Drizzle

For example, the average height of cloud bases measured by lidar in the area of the outer marker/outer compass locator and middle marker/middle compass locator proved to be 310 meters. Taking the above into account, we can estimate height of cloud bases on the basis of estimated aircraft height ($H_{свм} \approx 300$ м) and determine the number of the curve in the first quadrant, which is subsequently used.

The family of smoothly ascending curves 1, ..., 6 indicates in the horizontal visibility value range $L_г = 2, ..., 8$ км the presence of a statistical relationship with landing visibility in relation to different height of cloud bases. The following expressions, valid for haze, were obtained in describing experiment results with a cubic polynomial:

1. $L_n = -0{,}001\,L_r^3 + 0{,}036\,L_r^2 - 0{,}098\,L_r + 1{,}606$ — for height $100 \leq H \leq 150$ м.
2. $L_n = 0{,}009\,L_r^3 - 0{,}086\,L_r^2 + 0{,}437\,L_r + 1{,}100$ — for height $150 \leq H \leq 200$ м.
3. $L_n = 0{,}012\,L_r^3 - 0{,}128\,L_r^2 + 0{,}723\,L_r + 0{,}708$ — for height $200 \leq H \leq 250$ м.
4. $L_n = 0{,}011\,L_r^3 - 0{,}086\,L_r^2 + 0{,}484\,L_r + 1{,}252$ — for height $250 \leq H \leq 300$ м.
5. $L_n = -0{,}001\,L_r^3 + 0{,}100\,L_r^2 - 0{,}330\,L_r + 2{,}560$ — for height $300 \leq H \leq 400$ м.
6. $L_n = 0{,}025\,L_r^3 - 0{,}256\,L_r^2 + 1{,}412\,L_r + 0{,}022$ — for height $H > 400$ м.

Of course calculations using these formulas with other weather phenomena will lead to an error, and especially with the sixth equation (cloud base height more than 400 meters -- this would include 500 meters, 600 meters, etc).

We know from practical flight experience that, in addition to direct worsening of visibility, rain and drizzle cover the cockpit canopy with a thin film of water, which further lessens visibility. Of these two phenomena, assuming light and moderate precipitation, visibility is worsened to a greater degree by drizzle, which involves higher moisture content in the air. Snow also impedes prompt spotting of ground reference points (especially with the temperature above freezing), and according to subjective reports sometimes creates the illusion of flying "blind" (as in solid clouds).

On the basis of processing data it was determined that, in comparison with haze, drizzle worsens landing visibility by an average of 20 percent, snow by an average of 16 percent, and rain by an average of 9 percent. These results are incorporated into the curves in the second quadrant:

$$L_{n'} = 0{,}8L_n = \,;$$
$$L_{n_*} = 0{,}84L_n = \,;$$
$$L_{n\cdot\cdot} = 0{,}91L_n = \,.$$

One should bear in mind that visibility-lessening figures are subject to revision in cases of heavy precipitation, and particularly in drenching downpours.

The third quadrant in the nomogram is used to determine maximum possible (theoretical) landing visibility, when visibility L_n at a given glideslope angle θ is a function solely of height of cloud bases: $L_n = L_n(H)$. In this case it follows that $L_{n\,max} = H/\sin\theta$ (Figure 1).

A comparison of this condition with analysis using the above formulas enables one to estimate the extent to which various factors lessen maximum possible visibility. The graph in the third quadrant can also be used, but with certain allowances in fairly rare instances of absence of haze and other phenomena, as well as at night when determining visibility of runway lights.

In Figure 2 the arrows show an example of using the nomogram. Let us assume that with a certain atmospheric phenomenon conditions correspond to height of cloud bases measuring 310 meters "by instrument" with horizontal visibility 5 km. On the basis of height of cloud bases (third and fourth quadrants) we immediately determine maximum possible landing visibility -- 6.7 km, as well as height of cloud bases estimated in relation to aircraft position -- 300 meters.

Figuring ground visibility at 5 km, we move up in the first quadrant to the point of intersection with curve 4, corresponding to height of cloud bases 250 < H < or = 300 m, and then parallel to the X axis into the second quadrant to the correction for the corresponding atmospheric phenomenon. After this we descend to the horizontal axis and take a landing visibility reading. Landing visibility will be approximately 2.9 km in haze, 2.7 km in rain, 2.4 km in snow, and 2.3 km in drizzle. Evidently actual landing visibility differs by approximately 60 percent on the average from maximum possible visibility.

Thus the nomogram enables us to estimate landing visibility and can help make a decision on conducting flight operations and on landing and launching aircraft (weather reconnaissance aircraft). The above equations can easily be translated into any algorithmic language, and calculations can be performed automatically.

By using this method and appropriate statistical material, one can solve a similar program for one's own home airfield or, following appropriate verification taking into account local physical and geographic conditions, one can utilize the proposed nomogram. A set of graphs for estimating landing visibility, similar to those contained in Figure 2, has been used for several

years of flight operations now in one of our Air Force units and, in the opinion of experts, meets practical requirements.

For understandable reasons the region containing height of cloud bases below 2,000 meters has not been investigated. This is due to the fact that, in the absense of low cloud cover and in the presence of phenomena lowering visibility to 2,000 meters or less, landing visibility is equivalent to horizontal visibility.

Helping Student Pilots Avoid Hard Landings

91441273h Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) p 22

[Article, published under the heading "Flight Safety: Experience, Analysis, Problems," by Military Flight Instructor 1st Class Col N. Litvinchuk, docent and candidate of technical sciences: "Again a Hard Landing"]

[Text] A hard landing is the most common incident leading to an aircraft mishap involving errors in flying technique. Such incidents comprise on the average more than one third of all landing errors made by student pilots. It remains unclear, it is true, who determined that landing the L-39 trainer, for example, with a load factor of 2.5 Gconstitutes a mishap-threatening incident, and how this load factor is linked to an actual hazardous situation for the aircraft.

One could agree with the existing situation if it actually benefited things. Many commanders believe that the higher the demands on "cleanness" of flying, including the landing, the more careful a pilot would be in executing a landing, and the better his performance will be. This is an excessively simplified view of the state of affairs, however, which fails to consider the human factor, and which in this instance causes the pilot to make other errors.

I believe that it is appropriate to note that a mishap-threatening incident with personal culpability is always extremely undesirable for the pilot, since it is "legally prohibited" by orders. And since this is the case, a pilot has no right to make such a mistake. As a result it is frequently equated with indiscipline, with the consequences of social-administrative action proceeding therefrom.

It was noted in an article entitled "Why Did the Pilot 'Lose' the Ground?" (AVIATSIYA I KOSMONAVTIKA, No 6, 1985) that a student pilot's endeavor to get a good view of the runway and to execute the landing as well as possible can lead to narrowing of his field of view and loss of ground perception. This can result in a hard landing.

We are all familiar with cases of hard landings in flight training due to the pilot obeying the instructions of the flight operations officer or his assistant to hold the control stick steady when correcting errors on landing approach. In many cases orders by certain flight instructors to hold the aircraft off a bit longer to establish proper attitude for touchdown have also resulted in a hard landing, although it is a well-known fact that this element of the landing procedure is not typical of jet aircraft.

This is a far from complete list of causes of pilot errors connected with the so-called human factor, even without considering the pilot's individuality. Practical flying experience as well as a survey of student pilots who have made hard landings indicate that many of them were unable to explain why they did what they did at the specific moment or to analyze their sequence of actions at that time. The pilot would withdraw "within himself," as it were. A so-called dominant state would arise, where the pilot, afraid of being punished for an incident, would involuntarily switch his attention to the sensory organs connected with sensation of the G forces generated by touchdown onto the runway, and it would remain until the aircraft was on the ground. This happens most frequently when a student pilot has already made a hard landing and has been strongly reprimanded for it.

At such moments the pilot continues pulling the stick back with a practiced movement, no longer perceiving distance to the ground and the aircraft approaching the ground. There is a lack of aircraft control feedback. In this case one of the variations of the final phase of the landing may occur: a normal landing, ballooning during the latter half of the float following roundout, a hard landing, as well as aircraft liftoff following touchdown.

Ballooning in the latter half of the float following roundout is particularly typical. It can be substantial in magnitude, and the pilot may initially not react to it at all, since he is unaware of it. This may continue until the flight operations officer or his assistant instructs over the radio: "Stop ballooning," or "Hold stick steady!", breaking him out of the dominant state. It is true that in many instances the pilot himself will involuntarily switch his attention to estimating height if the aircraft remains airborne for an extended time or if he is so high off the runway that he cannot help but notice it.

Procedures to correct errors on landing approach are well described in the operating manual for the specific

aircraft. But how should the pilot proceed in order to prevent his attention from being diverted from the ground to perception of the quality of the landing? First of all he must force himself to monitor height during final approach as well as the rate of approaching the ground, right down to touchdown, without anticipating this moment and without paying attention to G forces when runway contact is made. More attention should be devoted to practicing landing procedures on the simulator when preparing for a training flight. Experience indicates that subsequently this landing procedure is solidly assimilated by the student pilot.

The instructor pilot plays an important role in correcting this adverse phenomenon, but only if he is competent in these matters.

Failure to consider such "minor items" frequently ends in even capable student pilots leaving flying and leads to unwarrantedly high financial costs.

In conclusion I would like to note that the degree of complexity of aircraft and increased demands as regards combat effectiveness and flight safety requires that we address the pilot from the standpoint of flight psychology. This is not a new idea, but it is becoming increasingly more critical, taking on legal and ethical coloration. There is an optimum in any complex issue, including demandingness on the pilot.

Extremes, however, lead to a situation where some student pilots climb into the cockpit with a feeling of fear over the outcome of the flight. In such cases pilots feel no joy in anticipation of going up. I believe that the solution to this problem lies elsewhere than in placing hopes on the possibility of solving all problems by increasing demandingness, and particularly in improving flight personnel training methods grounded on comprehensive consideration of flight psychology and quality of flight operations support.

Despotic Aircraft Maintenance Officer Reassigned, Demoted

91441273i Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) p 23

[Article, published under the heading "Topics of Ethics," by Maj V. Arefyev: "Not At Any Cost...."]

[Text] A flight aircraft maintenance unit chief slot became available in the squadron. Having discussed possible candidates for promotion with his deputies and the party organization secretary, the squadron commander decided to give the job to Sr Lt V. Korneyev, crew chief [tekhnik] of an excellent-rated aircraft and an experienced, knowledgeable specialist. It is true that there had been occasional adverse comments about him for rudeness unkind sharpness toward subordinates and colleagues, but since this had not happened very often, no particular importance was attached to it. The reasoning went that a crew chief's job is to "push" his mechanics and the maintenance group specialists.

After being named chief, Korneyev sought to become solidly positioned in his new slot as quickly as possible, and at any cost. He was willing to use any and all means and methods. Abusive shouting, threat of punishment, and disciplinary punishments exerted emotional pressure on the flight maintenance personnel day after day.

Very soon WO P. Ivanchenko, who had served faultlessly for more than 20 years in Air Force units, had disciplinary action taken against him on three occasions. The second occasion was caused by the fact that he had tried to determine from the flight aircraft maintenance unit chief the reason for the first reprimand. After the third severe reprimand Ivanchenko submitted a formal request to be transferred to another subunit. The departure of this experienced maintenance specialist did not trouble Senior Lieutenant Korneyev.

"Ivanchenko and I would not have found common ground in any case," he told me. "The warrant officer did not want to understand the fact that I am not a wet nurse and am not going to try to persuade every mechanic conscientiously to perform his job duties and to carry out my instructions. I considered it necessary to demand obedience, and the stricter the better for my subordinates and for the job we are trying to accomplish...."

The method of "torquing down the nuts" which Korneyev had chosen led rather to the result that all maintenance personnel in the flight except for Sr Lt G. Yevseyev had received disciplinary action. Yevseyev, according to squadron party buro member Sr Lt N. Sklyaruk, had avoided punishment only because on several occasions he had spoken up at party meetings in support of the flight aircraft maintenance unit chief and had criticized those party members who had been expressing dissatisfaction with Korneyev's work style.

Things were hottest of all for Sklyaruk, who felt that the worst techniques in the arsenal of management by administrative fiat and pressure utilized by the flight aircraft maintenance unit chief were counter to the spirit of the time and were impeding the process of restructuring of combat training and indoctrination efforts in the subunit. Korneyev in turn accused party activist Sklyaruk of sowing seeds of dissension in the group and hindering the aircraft maintenance unit chief from strengthening discipline and order. In short, acute conflict was again building in the flight.

One might ask an obvious question: were the squadron and regiment leader-Communists aware of all this? It seems that they were. And they even tried to help, with advice. They would ask: "Can't you, as adults, get along? Get together, discuss your problems. The regiment and squadrons are faced with difficult tasks. You've got to understand that we just can't have strife at this time...."

Apparently also of importance to command personnel was the fact that Senior Lieutenant Korneyev, as they say, "was producing quota" in all flight aircraft maintenance unit work effectiveness indices. They did not seem to be much interested in the cost of this success. The main thing was that the scheduled number of aircraft were always ready for flight operations and that the aircraft serviceability factor inalterably met the requirements of guideline documents.

But the flight maintenance personnel, particularly party members, did not want a return to the times of appeals "to meet the plan at all costs," of actions geared to show and pretense, and of a scornful attitude toward those by means of whose labor plan targets and current tasks are accomplished. Higher headquarters and the political section were informed about the unhealthy atmosphere which had been established in the flight aircraft maintenance unit through the fault of party member Sr Lt V. Korneyev. A commission working in the squadron and regiment, together with the command element, political workers, and party organizations, took measures to correct the negative phenomena impeding perestroyka in the unit. Senior Lieutenant Korneyev in particular was removed from the position of flight aircraft maintenance unit chief for tactless behavior and serious deficiencies in indoctrination work, and was demoted.

Today it would seem that such a finale for the budding career of this subunit technical service leader-Communist is quite logical. The following idea is clearly present in all party documents which specify the strategy and tactics of perestroyka: new problems cannot be resolved with old methods. Korneyev, and not he alone, has now become convinced of this through his own experience. The flight maintenance personnel, with change in leadership, are not doing a worse job but are working better. And they are "making the plan" not at any cost but with amicable work effort in an atmosphere fostering efficient utilization both of the collective efforts of Air Force personnel and the knowledge and experience of each and every technician and mechanic.

In my opinion this fact speaks in favor of perestroyka better than any words and also attests to the fact that the process of glasnost and democratization of military affairs is increasingly more deeply and broadly encompassing Air Force units. It is too bad that in this instance as well the situation required intervention by the higher command echelon and political agencies.

Pilot Spatial Orientation Diagrammatically Visualized

91441273j Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 24-25

[Annotated diagram: "Spatial Orientation"]

[Text] Spatial orientation or three-dimensional situational awareness signifies understanding what possibilities for movement are offered by the environment.

Structure of Spatial Orientation:

—orientation relative to the immediate supporting surface (perception of the layout of the surface in the cockpit);

—orientation relative to the actual leading surface (ground):

—abstract modeling of spatial relations;

—utilization of abstract models: a) to interpret instrument-derived information; b) to interpret cockpit-exterior information (indirectly-expressed perception of layout of surfaces beyond the cockpit).

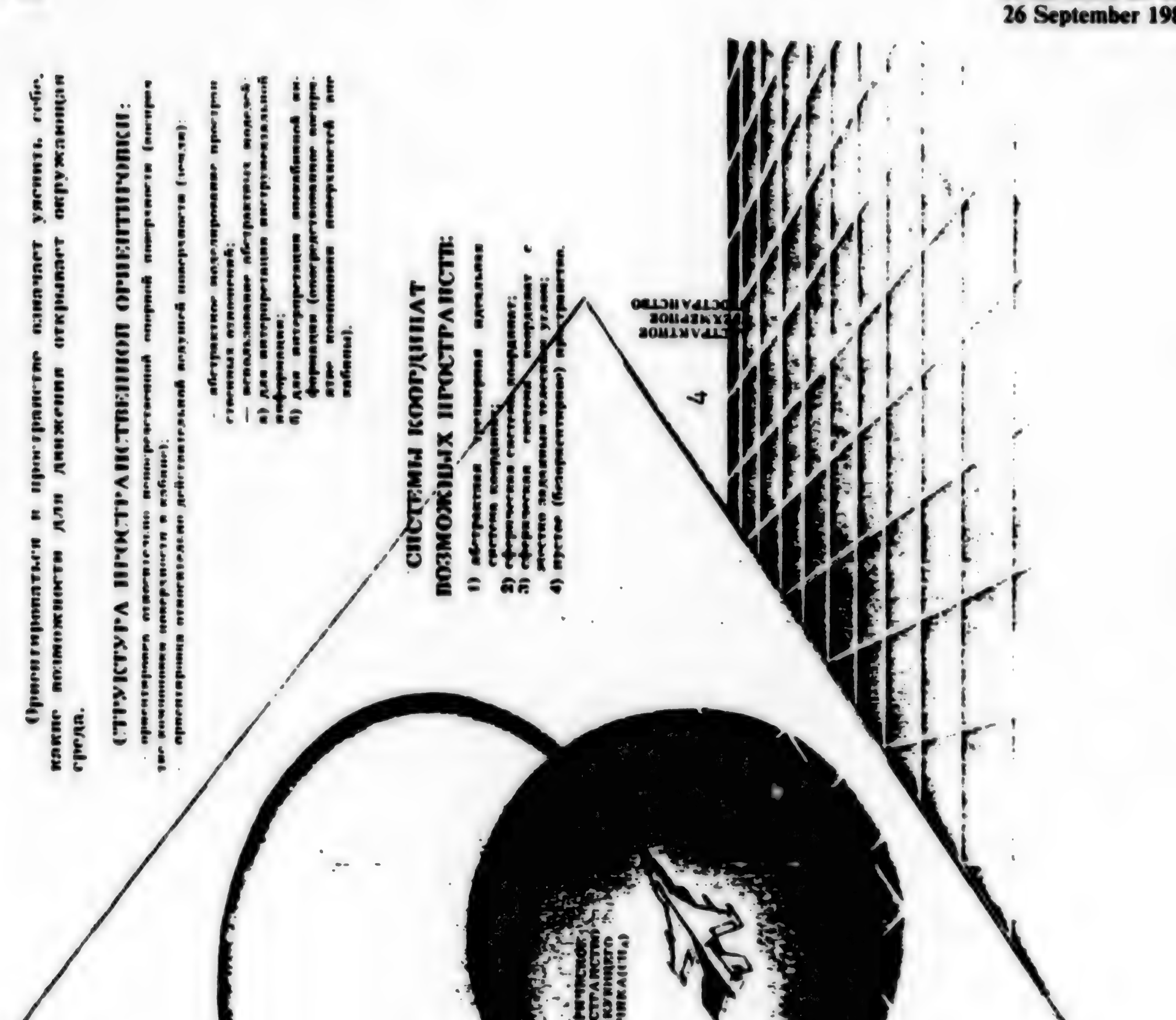
Coordinate Systems of Possible Spatial Systems:

1) abstract three-dimensional ideal coordinate system;

2) spherical coordinate system;

3) spherical coordinae system with rigidly-specified solid angle;

4) empty (lacking reference points) space.



Key:
1. Threat aircraft spherical space (SSta)
2. Plane of maneuver in abstract three-dimensional space (plane of transition from SSa to SSta)
3. Spherical space of attacking pilot (SSA)
4. Abstract three-dimensional space

Advantages of Multiple Passes on Ground Targets Analyzed

91441273k Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 28-29

[Article, published under the heading "Into the Military Airman's Arsenal," by Col (Ret) Ye. Lavrentyev, candidate of military sciences: "Is a Second Attack Run Necessary?"]

[Text] Modern combat aircraft carry potent armament. It is very important to be able to utilize it with maximum effectiveness. And the more modern the armament, the greater the number of weapons carried and the greater their accuracy, the more important is the problem of optimizing weapons delivery.

Recently the idea of fighter-bombers and ground-attack aircraft delivering strikes on ground (naval surface) targets in a single attack pass and without setting up a target run has been gaining increasing popularity. Such actions are practiced in the process of combat training, but they are most frequently utilized at various tactical exercises, and this is no mere happenstance. Many believe that a single-pass attack makes it possible to reduce losses to hostile air defense assets.

There is no question about the advantages of attacking the target on the first pass, without setting up for a target run. It is advisable in all cases where sufficient accuracy of bringing aircraft onto the combat maneuver initiation point is assured.

As regards flying the air-to-ground strike with a single pass, it cannot be considered the only acceptable procedure in all cases without exception.

Specialized theoretical studies indicate that the overall effectiveness of air-to-ground strikes by fighter-bombers and ground-attack aircraft, taking into account not only effectiveness of target engagement but also level of aircraft losses to hostile air defense assets, may prove greater when flying not one but several target passes.

This very important conclusion, which at first glance seems even paradoxical, is quite logical. First of all it is quite obvious that maximum effect from employing the entire aggregate of weapons carried by a modern aircraft is achieved only when flying several passes, on each of which one type of munition is employed. As a rule employment of various weapons on the same attack pass leads to diminished probability of hitting the target, due to diminished aiming accuracy and increased range of fire on the first salvo.

In addition, effectiveness of employment of one type of weapon (large loadout of bombs, rockets, or cannon ammo) is directly proportional to the number of attack passes, on each of which fire is delivered from as close as possible to the target. We know that when releasing or firing a large number of munitions in a single series, each subsequent release (shot) becomes increasingly less effective due to natural increase in error (following the law of dispersion). Particularly if one opens fire (commences release) with a certain error. In such a case the entire series will be wasted.

Calculations indicate that, beginning approximately with the 20th bomb or 100th rocket, incremental damage inflicted on the target becomes negligible. By a factor of approxiamtely 2-2.5 less than from the first part of the stick or ripple. Considerably greater effect can be produced by dividing the series into two or three segments. It should be reduced by 20-40 percent when attacking the same target, and by 40-70 percent when attacking several targets.

With a certain, fairly large number of bombs or rockets in the series, additional damage to the target inflicted by lengthening the series becomes less than the cost of bombs or rockets expended on this lengthening. This also proves the advisability of limiting to a specified number the number of bombs or rockets expended in a single series.

Increasing the number of ordnance delivery runs on the target appreciably increases the probability of effectively hitting a single target or increases the number of targets destroyed on a single combat sortie. And even if the aircraft is carrying only ordnance of a single type, it is advisable to expend the ordnance payload economically. It is better to distribute it among two or three attack passes on a single target. It is even better to distribute the ordnance loadout among several closely-spaced targets.

Unquestionably hostile air defense opposition in the target area, when several attack passes are flown, leads to an increased probability of each aircraft in the strike force taking a hit. In spite of this, however, flying several attacks (target passes) is preferable in many conditions. The fact is that the force of aircraft required to accomplish a combat mission depends on the number of attack passes. With an increase in the number of target passes, that is, with more efficient utilization of all available weapons, the required force of aircraft is substantially reduced. And correspondingly, aggregate strike force losses from hostile air defense actions en route to the target, in the target area, and during the return flight are reduced to some degree.

On the other hand, with an increase in number of attack passes, there is an increased probability that each aircraft in the strike force will be hit by local air defense fire.

Calculations produce interesting results. Let us assume a mission to destroy eight targets located in close proximity to one another with an assured probability of $P=0.8$. The probability of hitting the target on each attack pass is $W=0.5$. Probability of successfully penetrating hostile air defense en route to the target is $Q=0.95$, and on the return flight, $Qr=0.98$. Things work out as follows. The strike force will have the least losses when flying a single attack run if the probability that an aircraft will be shot down on a single attack pass, q, is

equal to or greater than 0.2. When flying two attack passes—if 0.2 is greater than q and q is greater than 0.13. And when flying three target passes—when q is equal to or less than 0.13. Proceeding from the quite realistic possibility of reducing the effectiveness of local air defense actions to q)it is advisable to fly several attack passes in order to reduce the subunit's combat losses when striking a group of targets.

The advantage derived from increasing the number of target passes increases with intensification of hostile air defense actions en route to the target and on the return flight, as well as with diminished air defense actions in the target area proper. Also important is the fact that with this approach part of the subunit's forces is freed up for simultaneously performing other missions.

Calculations indicate that when destroying four targets under certain conditions, with a target hit probability of W=0.5 on each attack pass and the probability that one aircraft will be shot down in a single attack pass in the target area is q=0.1, overall savings in expenditure of forces with two attack passes runs 45 percent, and approximately 60 percent with four passes. But if attack effectiveness is diminished by 25 percent for any reasons, then when q=0.1, flying three or four attack passes will produce a force savings of 30-40 percent.

Let us review. It is more advantageous to deliver strikes with a large number of aircraft and flying a single run on the target only with weak air defense response en route and strong air defense in the target area. If, however, one must penetrate strong air defense en route to the target and on the return flight (which is most typical for the conduct of combat operations in a modern-day war, especially in the western sector), while air defense is weak in the target area (as a result of air defense suppression by special support elements accompanying the strike elements), it is more advantageous to attack with smaller forces, flying several runs on the target.

In an actual combat environment the degree of prefability of flying several passes on the target will be determined not only by the above considerations connected with increasing strike effectiveness and reducing friendly losses to hostile air defense forces, but also with the necessity of attacking the target for a more protracted period of time. This applies in particular to air support of ground forces units and subunits. This is confirmed by the experience of air combat operations in the Great Patriotic War and in modern-day local conflicts.

Cannon armament is frequently employed in subsequent target passes by fighter-bombers and ground-attack aircraft. Cannon armament, in spite of the development of guided weapons and increase in the total loadout of externally-carried conventional free-fall bombs and rockets of various configuration, has retained its effectiveness. The high rate of fire of aircraft cannon, in combination with high muzzle velocity and considerable impact effectiveness of cannon projectiles, ensures a high probability of effective engagement of the majority of small, mobile, and armored targets. It is therefore not surprising that all potential adversary countries devote serious attention to cannon armament. It is highly unfortunate that in this country there has been a certain underrating of this type of weapon both in theoretical studies and in line-unit practical combat training.

In order maximally to diminish the effectiveness of hostile air defense in the target area, target passes subsequent to the first run on the target should be executed aggressively, swiftly, and from different directions, for which appropriate rigorously-calculated maneuvers with vertical and horizontal component are employed. With these maneuvers the flights or two-ship elements break for subsequent runs on the target involving diving approaches by two-ship elements or single-ship passes with minimum allowable forward separation between attacking aircraft. This increases the effect and result of subsequent attack passes on small targets employing rocket and cannon armament, because when attacking by single aircraft or a two-ship pair, better conditions are created for each pilot individually to aim at his target than with simultaneous attack by larger tactical units.

Maneuver parameters with repeat passes on the target depend on airspeed and the aircraft's maneuver capabilities. They cannot be identical for fighter-bombers and ground-attack aircraft.

Flying repeated passes on the target from various directions, especially when delivering simultaneous strikes as an element of large forces, requires very precise organization of the combat mission, highly-expert flying, precision formation flying ability on the part of flights and two-ship elements, and rigorous maintaining of specified parameters and configurations in the process of preplanned maneuvers. It also requires that pilots continuously inform one another of their location, the ability to make appropriate maneuver adjustments promptly and correctly, proceeding from the actual position of one's own aircraft and other aircraft at a given moment, as well as considering the current air situation in the target area. It also requires precise control by the strike element leader and the ground (airborne) command post.

Failure by the pilots of any strike element to maintain the prefigured angle of turn, airspeed, and degree of slip (G force) during a comearound target pass from a common direction exerts appreciable effect on the actual forward spacing between sequentially-attacking pairs or single aircraft in the given strike element as well as the direction of the attack passes. Large upward deviations in these forward spacings over preplanned spacings lead not only to extending the given strike element's maneuver time but also lead to extended time in the local air defense assets impact zone or threat area. Reducing spacings between attacking pairs or single aircraft of different strike elements violates flight safety procedures when mounting a multi-element strike. It can even result in failure to accomplish multiple passes on the target.

For this reason deviations in maneuver parameters with multiple passes on the target, which are inevitable in an air operation, are dictated and limited by the actual mutual positioning of sequentially attacking pairs or single aircraft. And this factor is continuously refined by visual observation forward of the airborne pairs (aircraft) or by the pilots periodically informing one another by radio of their current position.

What is our final conclusion? Development and practical employment of tactics to destroy ground (naval surface) targets in a single attack with the element of surprise is of great importance in conditions of heavy hostile air defense action in the target area. But one should not minimize the significance, effectiveness, and practical applicability of appropriate tactics of delivering simultaneous strikes on ground (naval surface) targets by forces of various composition and in as short a time span as possible, with execution of several results-producing runs on the target. The armament carried by modern-day aircraft not only permits such a mode of combat operations but sometimes requires precisely such tactical decisions.

Downed Frogfoot Pilot Rescued From Mujahideen

914412731 Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 38-39

[Article, published under the heading "Heirs of Victory," by Col Ye. Besschetnov: "Comrade for Comrade"]

[Text] On that cloudy day in January the squadron command flight departed for the Jalalabad area for the third time, to provide cover for delivery of a Soviet tactical air assault force. The ground-attack aircraft had just flown an attack pass, hitting rebel weapon positions, when Maj E. Ryabov, who was leading the second two-ship element, as he was pulling out following his ordnance delivery pass, heard the agitated voice of the forward air controller, warning that a missile had been launched.

A vigorous maneuver was called for, but the ground-attack aircraft, which had lost airspeed during the pullout maneuver, was slow in responding to the controls. Eduard Konstantinovich was able only to release heat flares. But it was too late. The next instant he felt the aircraft shake from a powerful impact into the tail section.

"Maybe all is not lost," he voiced a faint hope. Ryabov scanned the instrument panel. He immediately realized that a favorable outcome was highly unlikely. The situation was deteriorating rapidly. Both hydraulic systems had failed, the DC generators were down, leaving the aircraft without electric power, and now his engines had cut out....

Gathering himself, he applied force to the ejection handles. He was instantly ejected from the cockpit with cannon-shot force. After verifying that the parachute canopy had opened, he took a look around. What he saw was alarming: he was descending into a village. He knew that if he fell into the hands of the mujahideen he would never get out alive....

Fortunately he had enough height to slip his parachute at an angle, where he would touch down a short distance from the village. There he was ready and willing to fight, to fight to the last cartridge. A steady wind, as if coming to the pilot's aid, was drifting him ever further toward the safety of the mountains.

* * *

The other pilots, having completed the air-cover mission, at the element leader's command proceeded to orbit above the area where the pilot had ejected. Squadron executive officer Maj Valeriy Novogurskiy, flying wingman in the second two-ship element, now without an element leader, was agonizing over Ryabov's fate more than then others. How would things work out? He could see the large parachute canopy as it descended groundward. But where would the pilot touch down? In a village? Would he be killed? What would he then say to his wife Yelena Nikolayevna and his children, Yuliya and Konstantin?

There were firm bonds of friendship between him and Ryabov. Eduard Konstantinovich had never been devious, had never been a favor-currying yes-man to higher-ups, and he had always been fair. Such an experiential posture is characteristic of persons who know their job well and possess a great deal of spiritual and intellectual strength.

His comrades in arms did everything possible to rescue him. Squadron commander Lt Col G. Strepetov radioed a situation report back to the command post and urgently requested a couple of helicopters. He was counting on the assumption that Ryabov, after reaching the ground, would use his hand-held transceiver to report his position. This would facilitate search and rescue. But time was passing, the collapsed parachute canopy was already draped across the rocks, but there was as yet no emergency locator beacon transmitting. What was the problem?

Continuing to orbit over the mountains, the pilots had no idea what had happened. Had he gotten smashed up on landing? Had the mujahideen captured him? Had he damaged his transceiver upon hitting the ground? Just what was going on down there? They should drop down lower, but they might get hit by another Stinger.

"Look, there is a trail leading from the village into the mountains! And there are mujahideen on it! They are on their way out to the landing site," the squadron commander radioed. "Let's interdict that trail! We'll go in sequentially. We'll keep hitting them until the helicopters arrive!"

Lt Col G. Strepetov was the first to break from the formation and go into a steep dive. The ground-attack pilot lined himself up along the trail and squeezed the button. The two bunched clusters of rocket projectiles, striking the ground, threw massive smoke and flames into the air. As soon as he pulled up, he was followed in by his deputy commander for political affairs, Maj A. Rybakov, who "cleared" the trail a bit further on down, while Maj V. Novogurskiy carpeted the next section further on with rocket projectiles. The mujahideen responded only with machinegun and assault-rifle fire. That did not present such a threat. They went in for another pass.... .

* * *

But what had happened to Major Ryabov? Why had they not heard from him? The unforeseen had happened. His emergency survival kit (NAZ) had failed to deploy: something had kept it from deploying, perhaps it had been incorrectly packed, and it had remained under the seat. Ryabov detached it from the strap and pulled it toward himself, but it was hazardous to descend in that manner: he had to control his descent and prepare for ground contact. Ryabov, endeavoring not to be late in his response, hastily tossed the NAZ to the side so that it would be out of his way. He tossed it too energetically. The entire kit broke free, struck the rocks, and burst into flame. Apparently the signal flares had ignited. But the emergency survival kit contained a hand-held transceiver, an assault rifle, and several full magazines. Ryabov was now left only with a pistol and a single signal flare in his pocket....

He landed about a kilometer from the village. Although he came down hard, he did not break a leg, an arm, or damage his spine, which has happened to some pilots in similar situations. Releasing his parachute harness, he looked around. Ground-attack aircraft were circling overhead, his emergency survival kit was burning about 100 meters downslope, destroying the survival kit's entire contents, and about 10 or so turbaned figures were running toward him from the village: rebels.

It was very dangerous to remain where he was. Grasping projecting rock handholds, Eduard Konstantinovich proceeded to clamber up the slope in all haste. First of all he had to get as far away from the mujahideen as possible, and secondly, he had to find a suitable helicopter landing site. He had no doubt whatsoever that helicopters had been called in to rescue him. As he climbed ever higher, gasping from the physical exertion, he heard the typical sound of rocket bursts. He raised his head and saw that the ground-attack aircraft orbiting overhead had begun working over the area, trying to keep the rebels from capturing him.

But the flight's pilots were risking their lives by descending dangerously low. A warm flood of gratitude engulfed him. This bucked up his spirits: things would end well.

...Eduard Konstantinovich was born in Leningrad Oblast. After graduating from secondary school, he enrolled at the Yeysk Higher Military Aviation School for Pilots. In 1975, upon graduating with an engineer-pilot diploma, he was given a duty assignment in the Order of Lenin Moscow Military District and was stationed in that district about 5 years. He was then transferred to the Red-Banner Carpathian MIlitary District and made a flight commander, where he had to conversion-train from a fighter to a jet ground-attack aircraft. At his new duty station he soon became one of the most highly-proficient pilots and a skilled mentor of his subordinates. He soon was promoted to squadron deputy commander. He had arrived in Afghanistan three months back.

He had already flown several dozen combat missions. He had always acted with initiative and decisiveness in the air, and never lost his head. But today he had gotten it. Would he get out of this difficult predicament? His main hope lay with his comrades in arms. He would perhaps not survive without their support and help....

* * *

Since they first arrived in Afghanistan, the friendship and military comradeship within the squadron had been genuinely elevated to the rank of highest moral values. Everybody realized that if you save a friend, if you back him up, he in turn will save your skin at a difficult moment.

Literally two weeks after their arrival, the squadron's pilots were assigned the mission of providing air support to Afghan troops engaged in combat operations against mujahideen forces in the Panjshir Valley. Most of the pilots were not veterans. How should they proceed? Endeavoring to avoid unwarranted losses, the squadron command element assumed the brunt of the mission. Although the young pilots were anxious to get into combat, they were kept on the ground. During the first days combat pilots 1st class went out on the missions—the squadron commander, his deputy commander, the squadron political officer, the executive officer, and the pilots of Maj Georgiy Yelin's flight, who were more thoroughly trained than the others. They carried both their own mission load and that of the young, inexperienced pilots. It was difficult, but they handled the job well.

How did the younger pilots feel about this? Of course they were grateful to their older comrades for their paternal concern, but at the same time they were feeling an inner need to repay the dept. There is no need to add that they flew out on air-to-ground missions with great enthusiasm and stick-to-itiveness after they had become morally strengthened and acquired a certain degree of experience. They had a great deal of respect for their senior comrades, and they diligently followed their advice and instructions to the letter! All this brought the men closer together and helped them surmount the difficulties of the combat environment.

Friendship and military comradeship united the Air Force men with the fighting men of other combat arms. Major Ryabov recalled combat sorties into the Panjshir Valley, with the mission of urgently coming to the assistance of Soviet fighting men who had come under mujahideen fire. This was the case on one gloomy December day.

...The command flight was flying the mission that day as well. It was necessary to free from a rocky killing ground a motorized rifle battalion which was taking rebel fire from two directions. The rebel weapon positions were located about 100-150 meters upslope from the Soviet troops, who had taken shelter behind rocks. The slightest error, and you would be hitting friendly forces. But it was necessary to take the risk, to assume the full burden of responsibility....

A forward air controller accompanying the motorized riflemen radioed the coordinates of one target after another. The pilots quickly located them on the map, checked the map against the terrain and, breaking up into pairs, proceeded to attack the targets.

Major Ryabov and his wingman, having located their designated target—a heavy machinegun and its crew, located on the right side of a rocky area, turned to the target heading and streaked groundward. He took aim and rippled off a string of rocket projectiles to suppress mujahideen resistance, and a few seconds later, approaching closer to the target, he released bombs. Major Novogurskiy, following close on his tail, added to the force of the attack. Both delivered ordnance with marksmanlike accuracy. Not only burst fragments but also the rock talus which had broken free did not touch the friendly motorized rifle troops, but the target was covered. The two-ship element led by the squadron commander hit another weapon position sited on the facing slope. On their second pass the pilots destroyed mujahideen weapon crews positioned a bit further up the valley.

"Thanks," the forward air controller radioed on behalf of the motorized rifle troops, joy evident in his voice. "It's opened up. We'll be moving along now...."

Frequently the squadron's pilots, risking their own lives in the name of internationalist duty, would hit rebel arms storage sites and ammunition dumps, would neutralize rebel strongpoints, would come to the aid of Afghan ground units in trouble, and would provide them with air support during offensive action or in wiping out mujahideen bandit forces.

But what if one of our own pilots got into trouble? His comrades in arms were ready and willing to come to the rescue even at the cost of their own life. Maj E. Ryabov was firm in this conviction. There they were, overhead, protecting him....

While Ryabov, slipping and sliding on the scree, was hastily clambering up the slope, the ground-attack aircraft flew several passes somewhere over the mountain, from where danger apparently threatened him. At the moment they hit their targets, he would stop and take shelter behind the closest large boulder in order not to be hit by fragments. He did not keep an eye on the mujahideen—he was too busy with other things. In any case they seemed to be bogged down somewhere down at the foot of the mountain, as the point had gotten home to them that he would not be so easy to capture....

Reaching the summit, Ryabov was pleased to spot a small clear area. Even if a helicopter could not actually put down here, it could at least hover for a moment or two. The site was located near the trail, however, which the ground-attack aircraft were still raking. He took shelter among the rocks and, pressing flat whenever rockets nad bombs burst, patiently waited to be rescued. According to his calculations the pilots flew five rocket-firing passes apiece, plus four bombing passes. He was almost deafened from the bursts, but he was pleased: the mujahideen's path had been cut off, at least temporarily. And in this situation every minute counted....

The ground-attack aircraft once again proceeded to orbit: they were probably about to return to base. After all, they had expended all their ordnance, and they were low on fuel. Nothing you could do about it. A feeling of depression hit Ryabov for an instant. Would he be left without air cover?

But another thought kept intruding: "Could my comrades really leave me in the lurch?" And in fact, soon a four-ship element of ground-attack aircraft appeared over the mountains; they had come to relieve the command flight. He could determine by their fuselage numbers that it was Maj G. Yelin and his pilots. They proceeded to orbit above the mountains.

Perhaps 20 minutes had passed since ejection. Impatiently gazing skyward, Ryabov finally spotted two tiny, dark dots. That must be the search and rescue helicopters. They were drawing ever closer.

When the helicopters had approached to about 1,000 or 1,500 meters, Ryabov extracted from his pocket the signal flare he had grabbed before mission departure and ignited it. The gusty wind sweeping across the summit dragged the bright-orange smoke into a long, sweeping trail. The lead helicopter immediately turned toward it and proceeded to descend. A minute after it touched down Eduard Konstantinovich, grabbing the crew chief's [flight technician] hand, clambered into the cargo space.

"Everything's fine now," the crew chief shouted into his ear reassuringly. "Things could have gone bad," he pointed through the circular window: "There are 'spooks' [mujahideen] down there on the slope. They were getting close to you. They only had about 50 meters to go."

That evening Maj E. Ryabov was ferried by transport aircraft up from Kabul to his base at Bagram. He impatiently ran down the boarding steps; 10 or so of the men from his regiment were waiting by the aircraft,

concerned about whether he had made it in one piece. Seeing him there, alive and uninjured, they rushed forward to congratulate him on his safe return.

Eduard Konstantinovich served six more months in Afghanistan after this incident. He was awarded the Order of the Red Star. He too had occasion to come to the rescue of his comrades. And he responded just as those who had rescued him—boldly, courageously, selflessly, according to the laws of friendship and brotherhood in arms.

Officer Indignant at Soviet Media's 'Antagonistic' Attitude Toward Military

91441273m Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 40-41

[Article, published under the heading "Letters From Readers," by Sr Lt V. Novikov: "Demagoguery In Place of Glasnost"]

[Text] Esteemed editors of the magazine AVIATSIYA I KOSMONAVTIKA!

This letter is being written to you by Sr Lt V. Novikov, a student enrolled at the Air Force Engineering Academy imeni N. Ye. Zhukovskiy. What has impelled me to take pen in hand?

Recently the mass media have appreciably increased their attention toward various aspects of activities in our Armed Forces. All this would be well and good if certain publications, radio and TV programs did not show a tendency to try to ferret out and, I would say, relish certain negative facts, and sometimes distorting reality and casting doubt on the process of restructuring in the Army, Navy, and Air Force. They attempt to draw representatives of the most diversified strata of our society—from housewives to venerable scholars—into debate on these issues. Sometimes outspoken demagogues, who have not served in the military and are not familiar with it, expatiate behind the cover of democratization and glasnost.

In our officer group we frequently discuss various newspaper articles, radio or TV programs which deal with military topics. We military men, who possess both military service experience and practical combat experience, can immediately see the phoniness, contrived nature and distortion of reality in some "topical discussions."

This applies particularly to the subject of Afghanistan. Everybody fancies himself a strategist. But the worst thing is when there is deliberate falsification in print and over the air. For example, my comrades and I listened with indignation to a statement by Academician A. Sakharov in a Canadian newspaper interview to the effect that in Afghanistan our helicopter crews allegedly shot to death from the air our soldiers who had gotten into a difficult situation where they were in danger of being captured. Of course in a combat environment the situation can develop in various ways. But such savagery could occur only to people with a good deal of imagination. Unfortunately this is not an isolated example.

I could not remain indifferent to such fabrications. I decided to turn to the mass media and tell people the true story of the daily lives of our Air Force people, their difficult but honorable service, and our indissoluble comradeship in arms.

Two years ago in Afghanistan fate brought me together with a TV reporter from the program "The World and Youth," VLadimir Mukusev, who is currently on the editorial staff of the TV program "View." He responded keenly to everything he saw firsthand in the lives and daily military service of soldiers stationed in Afghanistan. This was subsequently reflected in the TV film "Airplane From Kabul." Having kept up my acquaintance with him, I knew that Vladimir was continuing to work on the Afghanistan topic and was being assisted by those who had carried out their internationalist duty in Afghanistan.

A military pilot friend of mine, Hero of the Soviet Union Capt Nikolay Maydanov, was in Moscow in January of this year. Who better than he would be able to relate fully and truthfully the military labors of our officers and enlisted men in the Republic of Afghanistan? I said something to Mukusev to this effect. He agreed with me and invited the two of us to take part in the program "View."

And you know what happened? From the very outset the interview in front of the camera took on a quite unexpected turn for us. The questions Mukusev asked were by no means in conformity with the desire to shed light on the realities of life in the military but were rather of a provocational nature. Here are just a few of the questions: "U.S. military personnel who were veterans of the war in Vietnam tossed their decorations down on the Capitol steps. Do you, Nikolay, and all other decorated Afghan veterans not intend to take your medals to Red Square?" "Why does our country need such a large military establishment?" "Why is it that the first thing military units did on arriving in Armenia was to build parade grounds rather than immediately going to the assistance of the earthquake victims?" Forced into debate, we were compelled, contrary to our wishes and convictions, to respond in one way or another to these provocational questions.

In my opinion Nikolay Maydanov replied in a reasonable and intelligent manner. His replies, however, apparently did not fit into the scenario that had been worked out in advance since, to use the interviewer's words, they were insufficiently "incisive." And you can imagine our surprise when we viewed the program in its final viewing form, a cleverly assembled presentation in which the conversation which had taken place at the TV studio was

presented in a totally different light than had been the case in actual fact. In addition, they had added items which they had assured us were not being filmed and would not be part of the interview! Nikolay is as upset about this as I am. The TV producers distorted reality, endeavoring to gloss over all the fine things in which our Armed Forcs are so replete. And to give "weight," they decided to use not some amateurs but Afghan-veteran military personnel, one of whom was in addition a Hero of the Soviet Union.

Thus we, without any such intentions whatsoever, perhaps contributed to some people developing a false opinion of our Armed Forces. And yet what we wanted to do was to show with the help of television the importance and significance of military labor and to tell about those fine traditions and about our comrades—people with a high sense of duty and honor.

We were not seeking personal glory in Afghanistan but were performing our internationalist duty. Nikolay Maydanov flew 1,250 combat missions. Any one of them could have been his last. He repeatedly risked his life in full awareness of that fact, rescuing comrades in trouble, not killing them, as some people claim.

Our other pilots and technicians also acted in precisely this vein. I saw this with my own eyes while taking part in disaster recovery efforts at the Chernobyl nuclear power generating plant and when I was stationed in Afghanistan. My comrades were among the first to come to the aid of the earthquake-stricken Armenian people. And wherever my comrades happened to be—in Afghanistan, at Chernobyl, in Armenia—they were the first, they were where things were difficult, where bold, reliable people and highly-proficient specialists were needed. They included Russians and Ukrainians, Kazakhs and Uzbeks, and members of other nationalities and ethnic groups. A single thing united all of them: a sense of duty, a feeling of responsibility to their people and to the homeland. I am proud that I was among them. I, just as Nikolay Maydanov, am proud of my decoration—the Order for Service to the homeland in the USSR Armed Forces, 3rd Class.

I have no intention of making everything sound idealized. There are problems in the Armed Forces, and there are issues that must be resolved. We see them, as do our superiors and, I believe, as clearly as those who, having no direct involvement with the military, are attempting to present it in a different light and to sow seeds of distrust of and unfriendliness toward the military.

Perestroyka, concrete measures and actions, not demagogic debates, are called upon to solve the problems which have arisen in our society and in the Armed Forces. As we know, one of the main tasks was formulated at the 19th All-Union Party Conference. I am talking about the need to ensure effective defense organizational development primarily through qualitative parameters, both in respect to equipment and personnel. I believe that every sensible person realizes that this is being done in the interest of our country's defense capability. It seems strange to my comrades and me that a ruckus is being raised not somewhere abroad, not in the camp of the potential aggressor, so to speak, but right here at home, with the objective of defaming and smearing everything that has been, is now, and will continue to be sacred to every citizen-patriot.

Soviet Space Launches in 1988

91441273n Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 42-43

[Chronological listing: "Table of Space Vehicle Launchings in the USSR in 1988"]

[Text]

Launch Date	Name of Vehicle	Initial Orbital Parameters				Ballistic Lifespan, Years (date retired)
		orbital period, min	apogee, km	perigee, km	inclination, deg.	
1	2	3	4	5	6	7
6 January	Kosmos 1908	97.7	678	650	82.5	60
15 January	Kosmos 1909	113.8	1425	1390	82.6	10,000
15 January	Kosmos 1910	113.8	1428	1399	82.6	10,000
15 January	Kosmos 1911	113.9	1431	1405	82.6	10,000
15 January	Kosmos 1912	113.9	1431	1412	82.6	10,000
15 January	Kosmos 1913	114.1	1438	1421	82.6	10,000
15 January	Kosmos 1914	114.1	1440	1426	82.6	10,000
21 January	Progress 34	88.8	277	191	51.6	[4 March 1988]
26 January	Kosmos 1915	90.3	402	207	72.9	[9 February 1988]
30 January	Meteor 2	104.1	973	947	82.5	520

Launch Date	Name of Vehicle	Initial Orbital Parameters				Ballistic Lifespan, Years (date retired)
		orbital period, min	apogee, km	perigee, km	inclination, deg.	
1	2	3	4	5	6	7
3 February	Kosmos 1916	89.9	384	179	64.9	[27 February 1988]
17 February	Kosmos 1917	75.0	195	173	64.6	[17 February 1988]
17 February	Kosmos 1918	75.0	195	173	64.6	[17 February 1988]
17 February	Kosmos 1919	75.0	195	173	64.6	[17 February 1988]
18 February	Kosmos 1920	88.8	268	193	82.6	[9March 1988]
19 February	Kosmos 1921	90.4	408	215	70.2	[4 March 1988]
26 February	Kosmos 1922	11 hours 49 min	39,344	612	62.8	15
10 March	Kosmos 1923	89.5	332	205	72.8	[22 March 1988]
11 March	Kosmos 1924	114.5	1488	1409	74.0	9550
11 March	Kosmos 1925	114.6	1487	1429	74.0	9550
11 March	Kosmos 1926	114.8	1487	1438	74.0	9550
11 March	Kosmos 1927	115.0	1487	1449	74.0	9550
11 March	Kosmos 1928	115.2	1488	1457	74.0	[5 September 1988]
11 March	Kosmos 1929	115.4	1493	1471	74.0	9550
11 March	Kosmos 1930	115.6	1509	1473	74.0	9550
11 March	Kosmos 1931	115.8	1528	1482	74.0	9550
11 March	Molniya 1	11 hours 39 min	38,996	491	62.9	11
14 March	Kosmos 1932	89.7	279	256	65.0	[20 May 1988]
15 March	Kosmos 1933	97.7	675	650	82.5	60
17 March	IRS 1A	102.7	917	863	99.0	[17 March 1988]
17 March	Molniya 1	12 hours 15 min	40,584	655	62.9	17
22 March	Kosmos 1934	104.7	1021	967	83.0	1200
24 March	Progress 35	88.9	280	190	51.6	[5 May 1988]
24 March	Kosmos 1935	89.5	356	179	67.0	[8 April 1988]
30 March	Kosmos 1936	89.0	290	189	64.8	[18 May 1988]
31 March	Gorizont	24 hours 36 min	36,634	36,491	1.4	1,000,000
5 April	Kosmos 1937	100.6	813	774	74.0	120
11 April	Kosmos 1938	89.4	316	209	72.8	[25 April 1988]
14 April	Foton	90.5	397	225	62.8	[28 April 88]
20 April	Kosmos 1939	97.6	678	623	98.0	60
26 April	Kosmos 1940	24 hours 01 min	36,380	35.900	1.2	[14 September 1988]
27 April	Kosmos 1941	89.3	293	217	70.3	[11 May 1988]

Launch Date	Name of Vehicle	Initial Orbital Parameters				Ballistic Lifespan, Years (date retired)
		orbital period, min	apogee, km	perigee, km	inclination, deg.	
1	2	3	4	5	6	7
6 May	Ekran	23 hours 47 min	35,653	35,589	0.4	1,000,000
12 May	Kosmos 1942	89.8	385	178	67.0	[4 July 1988]
13 May	Progress 36	88.8	262	193	51.6	[6 June 1988]
15 May	Kosmos 1943	101.2	876	851	71.2	150
18 May	Kosmos 1944	89.4	311	205	64.8	[24 June 1988]
19 May	Kosmos 1945	90.3	391	217	70.4	[31 May 1988]
21 May	Kosmos 1946	11 hours 15 min	19,157	19,113	64.9	1,000,000
21 May	Kosmos 1947	11 hours 15 min	19,156	19,113	64.9	1,000,000
21 May	Kosmos 1948	11 hours 15 min	19,156	19,113	64.9	1,000,000
27 May	Molniya 3	12 hours 17 min	40,716	636	62.5	17
28 May	Kosmos 1949	93.0	431	412	65.0	2.7
30 May	Kosmos 1950	116.0	1534	1503	73.6	10,000
31 May	Kosmos 1951	88.8	272	187	82.3	[14 June 1988]
7 June	Soyuz TM-5	88.6	234	202	51.6	[7 September 1988]
11 June	Kosmos 1952	89.4	300	215	70.0	[25 June 1988]
14 June	Kosmos 1953	97.8	680	647	82.5	60
21 June	Kosmos 1954	100.8	819	783	74.0	120
22 June	Kosmos 1955	89.8	382	181	64.8	[20 August 1988]
23 June	Kosmos 1956	88.8	256	196	82.3	[7 July 1988]
5 July	Okean	97.8	680	651	82.5	60
7 July	Kosmos 1957	88.7	256	194	82.6	[21 July 1988]
7 July	Fobos 1			Interplanetary flight path		
12 July	Fobos 2			Interplanetary flight path		
14 July	Kosmos 1958	92.4	417	375	65.8	2.1
19 July	Progress 37	88.8	273	194	51.6	[12 August 1988]
19 July	Kosmos 1959	104.8	1019	975	83.0	1200
26 July	Meteor 3	109.4	1221	1198	82.5	8000
28 July	Kosmos 1960	94.5	518	475	65.9	4
2 August	Kosmos 1961	24 hours 23 min	36,410	36,210	1.4	1,000,000
8 August	Kosmos 1962	89.4	297	215	70,0	22 August 1988]
12 August	Molniya 1	12 hours 18 min	40,754	617	62.9	16.5

Launch Date	Name of Vehicle	Initial Orbital Parameters				Ballistic Lifespan, Years (date retired)
		orbital period, min	apogee, km	perigee, km	inclination, deg.	
1	2	3	4	5	6	7
16 August	Kosmos 1963	89.8	376	181	64.8	3 October 1988
18 August	Gorizont	23 hours 56 min	35,820	35,734	1.3	1,000,000
23 August	Kosmos 1964	89.4	297	216	70.0	7 September 1988]
23 August	Kosmos 1965	88.7	265	195	82.3	22 September 1988]
29 August	Soyuz TM-6	88.5	244	199	51.6	[21 December 1988]
30 August	Kosmos 1966	11 hours 48 Min	39,299	617	62.6	14.3
6 September	Kosmos 1967	90.3	409	206	72.9	[15 September 1988]
9 September	Kosmos 1968	88.7	262	192	82.3	[23 September 1988]
10 September	Progress 38	88.8	267	193	51.6	[23 November 1988]
15 September	Kosmos 1969	89.7	373	178	67.1	[13 November 1988]
16 September	Kosmos 1970	11 hours 15 min	19,154	19,122	64.9	1,000,000
16 September	Kosmos 1971	11 hours 15 min	19,154	19,122	64.9	1,000,000
16 September	Kosmos 1972	11 hours 15 min	19,154	19,122	64.9	1,000,000
22 September	Kosmos 1973	90.2	395	206	72.9	[10 October 1988]
29 September	Molniya 3	11 hours 42 min	38,937	646	62.9	12
4 October	Kosmos 1974	11 hours 49 min	39,342	613	62.8	14
11 October	Kosmos 1975	97.8	679	649	82.5	60
13 October	Kosmos 1976	90.2	396	206	72.9	[27 October 1988]
20 October	Raduga	24 hours 33 min	36,567	36,465	1.4	1,000,000
25 October	Kosmos 1977	11 hours 49 min	39,342	613	62.8	14
27 October	Kosmos 1978	90.2	394	206	72.9	[10 November 1988]
15 November	Buran	89.5	263	251	51.6	[15 November 1988]
18 November	Kosmos 1979	92.8	432	408	65.0	2.6
23 November	Kosmos 1980	101.9	880	852	71.0	150
24 November	Kosmos 1981	90.4	374	245	62.8	[8 December 1988]
26 November	Soyuz TM-7	88.8	256	199	51.6	—

Launch Date	Name of Vehicle	Initial Orbital Parameters				Ballistic Lifespan, Years (date retired)
		orbital period, min	apogee, km	perigee, km	inclination, deg.	
1	2	3	4	5	6	7
30 November	Kosmos 1982	90.4	403	215	70.0	[14 December 1988]
8 December	Kosmos 1983	89.5	270	250	62.8	[22 December 1988]
10 December	Ekran	23 Hours 42 min	35,540	35,474	1.4	1,000,000
16 December	Kosmos 1984	89.6	345	195	62.8	[13 February 1989]
22 December	Molniya 3	11 hours 40 min	39,042	477	62.7	11.5
23 December	Kosmos 1985	95.2	549	529	73.6	47
25 December	Progress 39	88.7	255	193	51.6	[7 February 1989]
28 December	Molniya 1	11 hours 40 min	38,870	654	62.8	13
29 December	Kosmos 1986	89.4	316	204	64.8	[11 February 1989]

Comments:

Kosmos is the designation of a series of satellites which have been launched on a regular basis (since 16 March 1962) from space launch facilities in the Soviet Union. Their program of scientific research investigation includes the following:

—study of the concentration of charged particles in the ionosphere, for the purpose of investigating propagation of radio waves, corpuscular stream and low-energy particles, the energy makeup of the Earth's radiation belts, to evaluate ratioactive hazard during extended space flights, processes of adaptation to weightlessness, primary composition of cosmic rays and variations in their intensity, the earth's magnetic field, high-frequency radiation by the sun and other celestial bodies, the upper layers of the atmosphere, effect of meteoric matter on space vehicle structural elements;

—research and experiments in the field of space materials science, obtaining in conditions of microgravitation semiconductor materials with improved properties and highly-pure biological preparations, effect of factors of space flight on living organisms, as well as the conduct of scientific and technical investigations and experiments in the interests of various branches and sectors of the economy and international cooperation, including hydrology, cartography, geology, agriculture, and environmental studies;

—development of components and equipment for a space navigation system designed to determine the location of civil aircraft, merchant marine and fishing fleet vessels, including aircraft and vessels in distress, experimental equipment for relaying voice and telegraphic information equipment, components and structural elements of satellites in various flight configurations, including linked-up configuration, development of new types of data-measuring equipment and methods of remote investigation of the earth's surface, atmosphere, and the world ocean;

—acquisition of current information for the purpose of studying the earth's natural resources and resources of the world ocean in the interests of various branches and sectors of the economy, science, and international cooperation.

Progress 34, 35, 36, 37, 38, and 39 are unmanned cargo craft designed to deliver various payloads to the orbital space station and to transport payloads from the space station to earth.

Meteor 2 and 3 are orbital meteorological system satellites with onboard equipment for global imaging of cloud cover and the underlying surface in the visible and infrared regions of the spectrum both in data storage and direct transmission modes, as well as for continuous observation of fluxes of penetrating radiation in circumterrestrial space, and acquisition of global data on vertical distribution of temperature (the first satellite was launched on 11 July 1975).

Molniya 1 is a communications satellite tasked with supporting operation of a long-range voice and telegraphic radio communications system, as well as transmission of USSR Central Television programming to

stations in the Orbita network (the first satellite was launched on 23 April 1965).

IRS 1A is an Indian satellite tasked with obtaining current information using electro-optical devices for the purpose of studying earth resources. On 17 March 1988 the satellite was turned over to the control of the Indian Space Research Organization.

Gorizont is a communications satellite tasked with providing 24-hour long-range voice and telegraphic radio communications and transmission of TV programming to stations in the Orbita and Moskva systems, as well as for utilization in the Intersputnik international satellite communications system (the first satellite was launched on 19 December 1978).

Photon is a satellite carrying onboard equipment designed to produce, in conditions of microgravitation, semiconductor materials with improved properties and highly-pure biologically-active preparations, as well as study of the processes which take place thereby.

Ekran is a TV broadcast satellite with onboard relay equipment, providing transmission of Central Television programming in the 10-centimeter band, to a network of community-type receiving equipment (the first Ekran satellite was launched on 26 October 1976).

Molniya 3 is a communications satellite (a further upgrade of the Molniya 1 and Molniya 2 communications satellites), tasked with supporting operation of a long-range voice and telegraphic radio communications system, transmission of USSR Central Television programming to Orbita network stations, as well as international cooperation (the launch of the first Molniya 3 satellite took place on 21 November 1974).

Soyuz TM-5, -6, and -7 are manned spacecraft.

Okean 01 is a satellite which provides current oceanographic information and data on ice conditions for various branches and sectors of the USSR economy and international cooperation.

Fobos 1 and 2 are unmanned interplanetary probes tasked with investigating the planet Mars, its satellite Phobos, the sun, and interplanetary space—unmanned base units to investigate the planets of the solar system, including during accomplishment of the Mars program. Specialists from Austria, Bulgaria, Hungary, GDR, Ireland, Poland, Finland, France, FRG, Czechoslovakia, Switzerland, Sweden, and the European Space Agency took part, together with Soviet scientists, in developing the instrumentation package. Communication with Fobos 1 was lost on 2 September 1988.

Raduga is a communications satellite with onboard relay equipment, tasked with supporting voice and telegraphic communications and transmission of TV programming. Equipped with multichannel communications gear (the first satellite was launched on 22 December 1975).

Buran is an orbital shuttle vehicle designed to be launched into earth orbit, to service space vehicles in orbit and return them to earth, to transport cosmonauts and cargo payload to orbital stations and to return them to earth, and to conduct research and experiments for various branches and sectors of the economy and science.

The space shuttle was boosted into orbit by the Energiya space shuttle launch vehicle and, after completing a two-orbit flight around the earth and completing its program, landed on a runway at the Baykonur Space Launch Center.

A total of 108 space vehicles were launched into orbit.

Plesetsk Satellite Launch Activities Described

91441273o Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 44-46

[Article, published under the heading "Space Flight Support," by Col V. Gorkov, candidate of technical sciences: "Launch Site—Plesetsk"]

[Text] Branch roads and rail lines built by military construction crews extend across swamp, bog, and forest, which even today provide a rich harvest of mushrooms and berries. They all begin at the housing complex and lead to the launch sites of our northern space launch facility. Accompanied by one of the facility officials, Boris Nikolayevich Morozov, we were heading to where specialist personnel, in readying a booster for launch, utilize intensive technology, to couch it in modern terms. One rarely reads about the Plesetsk Space Launch Facility, and little is written about it. This is why we propose to begin our acquaintance with it from a historical perspective.

At the time when at Baykonur they were readying to launch the world's first satellite, the first group of engineers and construction workers arrived in the Plesetsk area, led by Mikhail Grigoryevich Grigoryev, who subsequently became the space launch facility's first chief. Construction of the first launch site, for the "Korolev R-7," went on for two years under the most difficult conditions. At the same time roads were being built, buildings were being erected to house equipment, and housing was being constructed of local lumber. The operational acceptance document for the first complex was signed on 15 December 1959. Boris Nikolayevich Morozov came on the scene at that time.

During his 30 years at the space launch facility he has climbed every rung of the career ladder. There have been joys and moments of danger in the life of this outstanding test engineer. His comrade in arms, Candidate of Technical Sciences V. Ivanov, called him "the most veteran of veterans."

"How many satellites have been launched with your participation?" I asked Boris Nikolayevich.

"At first I kept count," he replied, "but I eventually lost count, for operations here were more intensive than at other space launch facilities in the Soviet Union. But I remember each and every project. Each one has its own character, its own features. It is true that we do not have such magnificent launches as at Baykonur. It is evidently for this reason that journalists rarely pay us a visit. But our northern region and the people who work here deserve to have people know about them. I am going to introduce you today with one of them—testing department chief Ravil Absalyamovich Khamitov. He has twice left to further his education and each time has returned, although he had tempting job offers. Khamitov felt here the joy of labor and involvement in great feats. And even the north was to the liking of this southerner." After passing several checkpoints, we drove up to the assembly and testing building (MIK). A few minutes later an electric-powered rail prime mover emerged from the portal of a masonry building five stories tall. It was pulling a transporter-erector unit, carrying a snow-white Tsiklon rocket and satellite payload. They were on their way toward the launch complex, situated several hundred meters from the MIK. We also headed in that direction.

A year ago USSR Glavkosmos began offering to foreign countries the services of the Tsiklon booster for the commercial launching of satellites. At that same time fragmentary information about this launch vehicle began appearing in the press. What kind of a rocket is it? The predecessor of the Tsiklon (its first two stages) first appeared at Baykonur in 1967. It was designed to launch some of the Kosmos series satellites. One limitation kept this booster from widespread use: all space vehicles it launched had to have their own sustainer motors to provide final boost into orbit.

In the course of operational use specialists became convinced of the exceptionally high reliability and sophistication of this booster's launch-readying process. At the time the idea was born to add a third, standardized stage, which would be able to place satellites weighing from 550 kg to 4 tons into a broad range of orbits. Preliminary flight testing began in 1977, and three years later the Tsiklon booster was adopted into operational service. It was put into regular service at the Plesetsk Space Launch Facility. A complex was built here, consisting of the MIK and a launch area with two launchers, all necessary service lines, equipment and support services. During the first years it was used fairly infrequently, but the work load grew as new satellites were designed and built. Today the Tsiklon booster is being intensively utilized to launch many orbital vehicles of scientific adn economic mission tasking.

The manner and procedure of readying it for launch in a technical readying area is traditional for Soviet launch vehicles. The stages are brought from the manufacturer to the MIK, where the acceptance procedure takes place. For the first two stages and component elements this is followed by a series of autonomous tests of electrical circuitry and compressed-gas systems. The third stage employs a more sophisticated readying process, which includes autonomous tests of all systems with the aid of automated process equipment. The satellite payload, which has been subjected to the full launch preparation cycle, is brought here from the orbital vehicle sasembly and testing building. the launch vehicle is assembled on the transporter-erector unit, and then is mated with the satellite. The electrical circuits of the launch vehicle and satellite are final-tested, the nose fairing is put in place, and the fairing and satellite separation systems are checked. Access by servicing personnel to the launch vehicle and satellite payload ends with this. All subsequent operations are performed automatically.

We shall list several other specifications and performance figures which our readers have asked about in their letters. The booster is 39.3 meters tall with standard nose fairing; the first and second stages are 3 meters in diameter, while the third stage is 2.7 meters in diameter. The propellant components are self-igniting: unsymmetrical dimethylhydrazine and nitrogen tetroxide.

The third-stage motor can be ignited for a second burn. In connection with this, two satellite orbital insertion configurations have been adopted. A first and second-stage boost phase running about 280 seconds, and a following coast phase by the third stage and satellite is the same in both cases. The third-stage motor is subsequently ignited at the ballistic trajectory apogee. If it is necessary to boost the satellite into a higher orbit, the third stage is ignited for a second burn.

The Tsiklon can insert satellites into a broad range of orbits, between 200 and 3,600 km for near-circular orbit, depending on how heavy the satellite is, and 200-8,000 km for elliptical orbits. Inclination to the plane of the equator is 73.5 and 82.5 degrees.

Now let us visit the launch pad. The electric-powered rail prime mover with the transporter-erector unit approaches the launcher. There is not a soul around. This seems not only strange but incomprehensible to an outsider who is little acquainted with such systems. How can a space vehicle be launched without people?

Within a few minutes the launch vehicle has been raised into vertical position. All electrical, compressed-gas, and hydraulic connections, mounted at the tail end, are automatically switched with ground equipment. At this moment the scene is reminiscent of an anthill during bad weather, when all ant activity moves to the interior. That is the way it is here as well: the entire launch team has gone into the bunker. But the bunker is not only a shelter for personnel in case of emergency. Preparations to launch this next Tsiklon booster take place in this equipment-crammed underground structure, which houses a large number of control console rooms.

Extensive adoption of automated launcher process equipment control systems makes it possible to employ a

flexible process of readying a booster for launch across a broad timeframe. And during all this time the launch vehicle and payload equipment, the bunkers, and the people operating them are all engaged in a common, integrated operation. And it is reflected in the system of operation-by-operation TV monitoring of the status of the most critical components, in the common time system and digital computer bays, and on the chief operator's console, where the principal information is visually displayed.

Today Ravil Absalyamovich Khamitov is manning this console. He is a lean, calm and assured individual, with a soft voice and intelligent, piercing gaze. It is pleasant to be in the company of such individuals. They not only know how to talk but to listen as well as to understand others. I introduce myself, and we agree on a time to get together.

Yes, things are quite unusual here. It took less than 3 hours to move the launch vehicle and payload out to the launch pad, to erect it, to fuel the launch vehicle and prepare for launch. The launch is also unusual. It lacked that protracted flash and gradually-increasing roar typical of the R-7 rocket. The iaunch vehicle "does not pause to think" about whether or not it should lift off the launch pad. Its liftoff, just as its flight, is swift. One second passes, another.... And it is only the ringing sound of the rocket motors which remind you that a rocket was standing there a few seconds ago.

I met with Khamitov at the agreed-upon time. My first impression had been right: we not only quickly found common ground but also common acquaintances. And as always in such cases, we began with history. Ravil Absalyamovich told of the difficulties which they had experienced at first with working up the documentation and how, working together with representatives of the Chief Designer, they had tweaked the rocket into shape. Those who labored purposefully and selflessly during those years included B. Morozov, B. Zudin, A. Alentyev, G. Yuryev, V. Vlasov, V. Sosnin, and S. Burtsev. Thanks to their high level of professional expertise and proficiency, and ingenuity in solving technical problems, the highly-complex orbital payload launch system was soon off and running. Today, as they analyze past operations, the test engineers already see the next-generation system which will replace the Tsiklon. It will be fully automated both on the launch pad and in the technical area.

Ravil Absalyamovich then told about problem situations in which the test personnel had displayed not only staunchness and courage but also a national-interest approach in assessing the situation.

In January 1988, for example, during preparations to launch Meteor 2, the automatic launch sequencing stopped at T minus six seconds. The reason for the launch sequence interruption was trivial—a chemical battery had failed to come up to nominal operating reading within the specified time, but the consequence.... The documentation called for draining the fuel, neutralizing and disassembling the rocket, with its subsequent destruction. Department specialist personnel, having analyzed the situation, suggested that the rocket be used again, after first carrying out a number of procedures. The enterprise which had developed the rocket agreed with the opinion of the specialists at the space launch facility. Two days later Meteor 2 was launched.

The department drew up another interesting proposal. Spare parts, components and accessories for the Tsiklon are figured for a service life of 7 years. After this they are discarded. Department specialist personnel proposed that service life be extended by replacement. The idea was that items the service life of which would soon lapse would be placed on the launch vehicle from the spare parts, components and accessories package, and replacements would be made with new items removed from the booster. The benefit to be derived was mutual and benefited the economy as well. There is no need for the space launch facility to order lacking items, and there is no need for the plant to manufacture them.

"Ravil Absalyamovich, how do you people come forth with an initiative, and how is an initiative implemented?"

"On our team any useful new innovation was welcomed and brought joy. As for the sources of an initiative, I believe they lay in one's attitude toward the job. When a launch vehicle came to the space launch facility, everybody considered it his own, his own personal property, if you will. And following the successful launch of a satellite payload into orbit there would not be a single person who did not feel happy over the success of the common cause. This is what gives us strength.

"Party organization secretary Denisov and I have always advocated the principle of social justice. In my opinion it contains great potential for our society in general. But in order to be guided correctly by it, one must know well the people with whom one works, look closely at their lives, be aware of each person's 'weak spots,' and not be afraid to raise sharp issues for general discussion. This helps avoid discord, helps eliminate excessively close supervision, and helps each individual feel independence, that is, helps generate an atmosphere of creative inquiry—the foundation of our work. All questions connected with transfer, reward, and social needs are first discussed in the laboratories and are subsequently presented for discussion by the department's personnel."

In our subsequent discussion we touched upon matters pertaining to training young people. I should state that it has long since become a tradition at the space launch facility to keep an eye on this problem. And this tradition originated with those who were the first to work as test engineers. They included V. Eybshits, D. Mukhinskiy, S. Yesenkov, V. Buzenko, G. Ivoninskiy, Yu. Zhaboyedov, and V. Kalinin. These traditions are being further developed in improving the work forms and methods of

mentors charged with training young specialist personnel. A. Ryabov, I. Sinyagovskiy, V. Kabanov, and A. Proskurin were named among the best mentors.

...The jubilee satellite Kosmos 2000 was launched from the Plesetsk Space Launch Facility in February. A mass meeting was held after the launch, at which those who spoke called upon test personnel to maintain and further build upon the traditions of the veterans for the benefit of development of science and technology, our country's economy and culture.

Returning Mir Space Station Crew Holds Press Conference

91441273p Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 5, May 89 (signed to press 10 Apr 89) pp 46-47

[Interview, published under the heading "Pertinent Interview," with returned cosmonauts by AVIATSIYA I KOSMONAVTIKA, interview recorded by AVIATSIYA I KOSMONAVTIKA special correspondent G. Glabay: "Orbits of Courage, Peace, and Cooperation"]

[Text] **Soviet cosmonauts have completed the longest manned space flight in history, lasting a full year. A citizen of France, who for a period of 23 days had performed scientific investigations aboard the Mir orbital complex, returned to earth with them.**

Yu. Gremitskiy, first deputy chief, USSR Ministry of Foreign Affairs Information Administration, introduced the participants: Lt Gen Avn V. Shatalov, commanding officer, Cosmonaut Training Center imeni Yu. A. Gagarin; pilot-cosmonauts USSR V. Titov and M. Manarov; citizens of the French Republic mission specialists Jean-Loup Chretien and Michel Tognini; A. Dunayev, chief of USSR Glavkosmos; mission director V. Ryumin; and A. Grigoryev, director of the USSR Ministry of Health Institute for Biomedical Problems.

The interview with the participants in the press conference was recorded by AVIATSIYA I KOSMONAVTIKA special correspondent G. Glabay.

* * *

[Reporter] Vladimir Georgiyevich, during the course of such a long orbital mission did you ever feel the desire to abandon everything and return to earth, of course if Mission Control had approved? In addition, how long a time in orbit do you consider optimal?

[Titov] Our life aboard the orbital complex was planned and scheduled in such a manner that such thoughts simply did not come to us. In addition, from the very beginning we knew the duration of the mission and naturally were prepared mentally in advance to return on 21 December 1988. Our entire mission program was based on this timetable.

As regards an optimal time to spend in orbit, in addition to our opinion one should consider the objective assessment of the medical people, who have obtained unique information on the effects of such extended missions. I consider about five to six months an optimal stay in orbit.

[Reporter] Jean-Loup, what are your impressions on the psychological atmosphere and state of health of the crew members who had spent such a long time in orbit? How do you assess your own flight as a whole?

[Chretien] First of all I would like to say that the psychological atmosphere created by our hospitable comrades aboard the station was excellent. From a psychological aspect it was apparently caused by the fact that the end of the mission was nearing as well as by our visit. The physical condition of both crew members was good. Our mission was flown under optimal conditions. Everyone was in excellent form, and the mission proceeded beautifully.

[Reporter] How does weightlessness affect muscle tissue and calcium loss?

[Titov] As for loss of muscle tissue, it certainly did occur, and for the greater part affected the legs. Quite frankly we were nervous just prior to our descent from orbit. How would we feel back on earth? We constructed various hypotheses, but everything turned out to be better than we had anticipated.

Cosmonauts experience considerable physical and emotionl stress during an EVA. The presence of a doctor, however, and those preventive remedies which we had at our disposal made it possible quickly to eliminate the fatigue which occurred from being in spacesuits for the six or seven hours required in preparing for and performing an EVA.

Today we feel fine. The question of calcium loss is somewhat specific. I believe that the medical specialists are more qualified to answer it.

[Grigoryev] It would probably be difficult to give a brief or concise answer to this question, for the mission was unique in duration. Of course during the entire mission and following it we performed detailed medical examination of the cosmonauts. A total of approxiamtely 300 examination sessions were held. And although the materials obtained from many of these sessions have not yet been processed, I can assure you that we did not record any qualitative changes which differed with previously recorded changes. The degree of these deviations was not greater than after shorter missions.

Of course this does not mean that no changes took place in the cosmonaut's organism during this mission. Changes were noted both during the acute period of adaptation and in the course of the mission and were of an adaptive nature. This was the system's reaction to being in conditions of weightlessness.

And one more thing. The mission commander just mentioned his apprehensions pertaining to the state of health of the crew members prior to their return. We doctors, however, on the basis of prognoses during the course of the mission and literally two days before it ended, were confident that our intrepid cosmonauts would be in a good state of health. We were convinced of this by functional stress tests, which indicated the crew's reserve capabilities. They were at a fairly high level, and unquestionably sufficient for good adaptation to the conditions of terrestrial gravity even after such a long flight.

[Reporter] Jean-Loup, you are uniquely able to compare the forms and methods of training cosmonauts and astronauts in the Soviet Union and the United States. What in your opinion are these differences, of course if differences do exist?

[Chretien] At first I shall state that the training of the mission commander and flight engineer or, if I may be permitted the expression, the crew's first echelon, is almost identical in the United States and in this country. There are no major differences in the training, although the spacecraft are quite different.

As for training of foreign nationals, there is a difference. Pursuant to a U.S. law, professionals employed by NASA are considered astronauts. All others, even Americans flying aboard the space shuttle, are trained as payload specialists, that is, on an abridged training program. This is why the training obtained there was not as complete as at Zvezdnyy Gorodok, where all crew members are trained as equals.

[Reporter] Could the mission director give us more detail on the technological experiments performed by the cosmonauts, and which of these experiments will be continued by the new crew?

[Ryumin] I should note that we have been working with technological experiments for a fairly long time. Such experiments were conducted aboard the Salyut 6 and Salyut 7 orbital stations. Today we are also conducting such experiments aboard the Mir orbital complex, but to a lesser extent. This is connected with preparation of a new module for operation in orbit. This group of experiments will be fairly substantially represented in this new module. But for the time being we are engaged only in experimental projects of a semiindustrial-semicommercial significance. We are gathering statistics and developing equipment.

[Reporter] Last year a book entitled "The Soviet Space Program" was published in the FRG, one of the chapters of which deals with the Mir orbital station. In particular, it is stated in this chapter that development in orbit of a system consisting of the most diversified modules docked with the station enables the Soviet Union to use this complex for military purposes, that is, to have its own strategic defense initiative. What can you say about this?

[Dunayev] I believe that it would be better for the cosmonauts to reply to this question. For my part I shall merely state that three international crews worked aboard the station this year, including Jean-Loup Chretien. Their testimony will mean more than my assurances.

[Chretien] Having worked in the Soviet Union for several years, I believe that I can claim the role of expert. A discussion of the statement made by this book's author could take hours. But one can assume that he was trying to make a joke. Otherwise he is simply a frivolous individual.

It is today clear to everybody that military experiments cannot be conducted aboard the Mir space station. It would require a spacecraft of quite a different type. It would have to be approximately 10 times larger than the space station and contain totally different instrumentation. In addition, this notion is not in conformity with the policy of the Soviet Union.

One must believe people when they say that they are not conducting military experiments in space. If we do not believe one another, we shall not get very far. This is particularly important today, when the Soviet leaders are calling upon everybody to engage in peaceful cooperation in space. Some people in the world, however, do not agree with this statement of the issue. I, however, do. And I know many military officers in the Western countries as well as cosmonauts who share my view.

[Shatalov] I think that those 30 foreign nationals who have visited our space stations can confirm everything Chretien has said. As for future station modules, foreign-national cosmonauts will also be able to refute the author's lie at a future press conference such as this, following successful completion of a mission. In conformity with plans for international cooperation, nationals of the FRG, Italy, and Austria may take part in our program. Time will show that our country's policy and our words are not at variance with one another. And they have never diverged in the area of the manned space program during all these years.

[Reporter] It is perhaps time to turn to terrestrial problems. The cosmonauts will be taking a rest for a while. Mountains are an excellent place for regaining one's strength and energies following a year-long mission. Will you not be going to Dagestan?

[Manarov] I have long been planning to take a trip to Dagestan. And I was planning to do so after this mission. But even now we have an extensive work program, and for that reason we must coordinate such matters with our superiors. Therefore it probably makes sense first to receive such an invitation, and then properly discuss it with the experts, and then determine the particulars of such a trip.

[Reporter] What is the present status of France's space program and what is being done toward its future development?

[Chretien] You are probably aware that our countries' leaders, Francois Mitterrand and M.S. Gorbachev, reached an agreement on 10-year cooperation in the area

of manned space exploration. This means that we shall be flying joint missions approximately every 2 years.

We would like there to be four such missions during this period. The mission program will be quite extensive. But in my opinion the most important element will be the training of crews for the Hermes spacecraft which, according to plan, is to be launched in about 10 years. We must train French pilots for the first mission, for 10 years is not very much for the cosmonaut profession. We would like to continue scientific and technical experiments.

[Dunayev] A large team of French specialists will soon be coming to our country for a visit. In the course of a get-together there will be discussion of a broad range of scientific and technical items which the French side would like to resolve in the process of future manned missions. There will also be discussion of the share of French participation in such a long-term space program.

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